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ASIA PACIFIC

The working with silica guide has been translated into six languages and will help protect those who work with silica or products containing silica

2020-06-30

Working with natural and engineered stone, asphalt, concrete, bricks or pavers can expose workers to silica dust. This guide provides information about reducing exposure to silica dust when working with silica and silica containing products. It will help persons conducting a business or undertaking (PCBUs) to understand and make decisions about protecting their workers from exposure to silica dust.

The guide for *Working with silica and silica containing products* is now available in:

- Arabic
- Chinese (simplified)
- Chinese (traditional)
- Greek
- Italian, and
- Vietnamese.

These languages were chosen as PCBUs from non-English speaking backgrounds are common in workplaces that use silica containing products, with Vietnamese, Chinese and Greek the primary languages spoken.

More information about crystalline silica and silicosis, including what it is, what work activities generate silica dust and how to reduce the dust, can be found on our website.

Safe Work Australia, 30 June 2020

<https://www.safeworkaustralia.gov.au/media-centre/news/translated-guide-working-silica-now-available>

South Korea consults on amendment to electronics legislation

2020-07-17

Proposes bringing four phthalates and 23 products under control of RoHS-like law

This guide provides information about reducing exposure to silica dust when working with silica and silica containing products.

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South Korea's Ministry of Environment is consulting until 19 July on proposals to add four phthalates and 23 products to the list of substances and products covered by the country's electronics legislation.

[Full Article](#)

Chemical Watch, 17 July 2020

<https://chemicalwatch.com/135487>

AMERICA

EPA rejects tougher air quality standards, says 2015 limits are sufficient

2020-07-13

Trump administration argues current limits on soot are protective of public health, even as critics say stricter rules are needed to protect vulnerable communities.

The Trump administration on Monday said it will maintain national air quality standards put in place in 2015, despite calls for more stringent regulations that advocates say are necessary to protect Americans in communities that are particularly vulnerable to a range of respiratory ailments.

In a call with reporters, Environmental Protection Agency Administrator Andrew Wheeler argued that the existing limits on fine particulate matter — otherwise known as soot — are sufficient, and that the decision was "based on a review of the scientific literature and recommendation from our independent science advisers."

The EPA's staff scientists recommended lowering the annual amount of particulate matter allowed into the air in a draft report last year, citing estimates that doing so could save thousands of lives. The agency's Clean Air Scientific Advisory Committee was split on the question, with some members calling for tighter standards and others saying the current one is sufficient.

On Monday, Wheeler said a majority of outside advisers recommended that the agency retain the existing standards. The agency also noted that ozone concentrations in the United States fell 4 percent between 2017 and 2019 and that numerous areas of the country that once had failed to meet air quality standards have come into compliance. In addition, the agency

Proposes bringing four phthalates and 23 products under control of RoHS-like law

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said, national average ozone concentrations have dropped 25 percent in recent decades, mainly due to reductions in emissions of nitrogen oxides and volatile organic compounds, pollutants that contribute to the formation of smog.

Soot can come from a variety of sources, including cars and trucks, smokestacks, incinerators and industrial operations. Fine particles of pollution can enter the lungs and bloodstream, causing inflammation that can lead to asthma, heart attacks and other illnesses.

Poor and minority communities in the United States historically tend to face greater exposure to air pollution, including soot, because they often are located closer to highways and industrial facilities. For instance, a 2019 study by the Union of Concerned Scientists found that on average, communities of color in the Northeast and Mid-Atlantic breathe 66 percent more air pollution from vehicles than white residents.

The uneven burden of air pollution borne by such communities and by people with chronic lung and heart problems, activists say, makes tougher standards essential.

“In the midst of the worsening respiratory public health crisis with tens of thousands of people being sickened daily by the coronavirus, the Trump administration is yet again doing nothing to make it easier to breathe,” Matthew Davis, legislative director for the League of Conservation Voters, said in a statement Monday. “By not strengthening the ozone standards, the Trump administration is perpetuating environmental racism for communities of color and putting children’s developing lungs at risk.”

Separately, a group of 15 health-based organizations, including the American Lung Association and the American Academy of Pediatrics, said Monday that the current standards endorsed by the Trump administration are insufficient.

“There is powerful, overwhelming evidence that shows that this standard is not adequate to protect the health of Americans,” the group wrote in a statement. “EPA’s proposal violates the core purpose of these standards under the Clean Air Act: to protect public health with an adequate margin of safety.”

The current rules limit ozone pollution to 70 parts per billion over any eight-hour period. But the group of public health experts said a growing body of scientific evidence suggests the threshold should be no higher than 60 parts per billion to adequately safeguard public health.

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Industry officials on Monday praised the EPA’s decision to stick to the status quo.

“Amid a global pandemic, manufacturers are serving on the front lines helping our nation respond to and recover from covid-19,” Rachel Jones, vice president for energy and resources at the National Association of Manufacturers, said in a statement. “So at a time when we are facing record-breaking unemployment, a lower ozone standard could slow our economic rebound and threaten manufacturing competitiveness. We shouldn’t have to choose between environmental protection and a strong economy.”

Frank Macchiarola, a senior vice president at the American Petroleum Institute, which represents the nation’s oil and natural gas sector, also said the Trump administration had struck a proper balance.

“EPA’s proposal to retain the current [standard] will help the U.S. continue to reduce emissions, protect public health consistent with the Clean Air Act, and enable economic growth,” Macchiarola said in a statement. “The decline in U.S. emissions, which has led to the cleanest air in half a century, is due in large measure to cleaner-burning fuels and advanced technologies.”

EPA officials said the agency would accept comments on Monday’s proposal for 45 days before the standards become finalized.

Washington Post, 13 July 2020

<https://www.washingtonpost.com/climate-environment/2020/07/13/epa-air-pollution/>

Colorado passes limits on dangerous ‘forever’ chemicals

2020-07-16

As federal regulations lag, state water officials unanimously pass new PFAS limits.

Colorado has its first policy to regulate so-called “forever” chemicals.

The state’s Water Quality Control Commission voted unanimously Tuesday to enact a policy to put new limits on per- and poly-fluoroalkyl substances, better known as PFAS. The class of chemicals is a common ingredient in everything from nonstick pans to foam used to smother flames from jet fuel.

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A growing body of scientific evidence has linked the chemicals to a range of health problems, including cancer and pregnancy issues. Meanwhile, federal efforts to regulate the chemicals have lagged, leaving states to take action on their own.

Liz Rosenbaum, founder of the Fountain Valley Clean Water Coalition, was relieved to see Colorado join the list of states cracking down on the chemicals.

Full Article

High Country News, 16 July 2020

<https://www.hcn.org/articles/pollution-colorado-passes-limits-on-dangerous-forever-chemicals>

More bad news for BPA: Novel analysis adds to evidence of chemical's health effects

2020-07-16

Exposure to minuscule amounts of bisphenol-A can cause a multitude of health problems, including effects on the developing brain, heart, and ovaries, according to a paper published on Thursday that integrates data from several animal studies.

The findings build on a body of evidence that absorbing or ingesting the ubiquitous chemical may harm people at doses 20,000 times lower than what the U.S. Food and Drug Administration (FDA) says is safe — doses comparable to levels at which most of us are exposed.

"This should change how the FDA and other people look at the safety of BPA," Jerry Heindel, former health scientist administrator at the National Institute of Environmental Health Sciences and a co-author on the new paper, told EHN.

The studies were part of an unprecedented \$30 million-dollar project co-led by the FDA called the Consortium Linking Academic and Regulatory Insights on BPA Toxicity, or Clarity for short. Launched in 2012, Clarity combines a traditional regulatory guideline study from the government and investigational studies from academics with the aim of reconciling a long-standing dispute over data and conclusions on the health effects of BPA.

Academic scientists for decades have linked the chemical—found in plastic containers, food can liners, and paper receipts—to a wide array

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of health problems including cancer, diabetes, obesity, infertility, and behavioral problems. BPA does its damage, in large part, by mimicking and messing with hormones in the body. And it is just one of hundreds of such endocrine-disrupting chemicals we encounter every day.

Full Article

Environmental Health News, 16 July 2020

<https://www.ehn.org/bpa-effects-on-human-health-2646417888.html>

Virginia becomes first state to adopt COVID-19-related workplace health and safety standards

2020-07-16

On July 15, 2020, Virginia's Safety and Health Codes Board (Board), the body that establishes Virginia Occupational Safety and Health regulations and standards, approved workplace safety regulations related to Coronavirus Disease 2019 (COVID-19). Virginia is the first state in the country to enact such a standard or regulation, though other states, like Oregon, may follow suit. According to Gov. Ralph Northam's office, the emergency standard was prompted by the alleged lack of enforcement from the Occupational Safety and Health Administration (OSHA), the federal agency that enforces workplace safety and health regulations. To date, OSHA has not created a workplace safety standard specifically related to addressing COVID-19 in the workplace, instead opting to issue a plethora of non-mandatory workplace safety and health guidance regarding COVID-19.

The Board's standard, titled "Emergency Temporary Standard/Emergency Regulation, Infectious Disease Prevention, SARS-CoV-2 virus that Causes COVID-19," (COVID-19 Standard) will go into effect July 27, 2020, and will expire in six months or when it is superseded by a permanent standard, whichever occurs first, or when the Board repeals the COVID-19 Standard. Like other safety and health standards and regulations, the Virginia Department of Labor and Industry is responsible for enforcing it.

The COVID-19 Standard is designed to provide basic protections for all employees and employers within the jurisdiction of the Virginia Occupational Safety and Health program. As an initial matter, businesses that choose to (and actually do) comply with Centers for Disease Control and Prevention (CDC) guidelines, whether mandatory or non-mandatory, to mitigate COVID-19-related hazards and job tasks addressed in the COVID-19 Standard, the employer's actions will be considered in

To date, OSHA has not created a workplace safety standard specifically related to addressing COVID-19 in the workplace, instead opting to issue a plethora of non-mandatory workplace safety and health guidance regarding COVID-19.

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compliance with the COVID-19 Standard. In other words, employers must comply with the COVID-19 Standard or all mandatory and non-mandatory CDC guidelines. The COVID-19 Standard requires all employers to:

- Assess their workplace for hazards and tasks that can potentially expose employees to COVID-19. Employers shall classify job tasks as either “very high,” “high,” “medium,” or “low” risk according to the hazards to which employees are potentially exposed:
- “Very high” exposure risk hazards and job tasks are tasks like medical, postmortem, or laboratory procedures where there is a high potential for employee exposure to COVID-19 or suspected sources of COVID-19.
- “High” exposure risk hazards and job tasks are tasks related to health care delivery and first responders to individuals known or suspected to have COVID-19.
- “Medium” exposure risk hazards and job tasks are tasks that require occupational contact inside six feet with other employees and the general public who may be infected with COVID-19 but who are not known or suspected to have COVID-19 (i.e., operations like poultry, meat, and seafood processing, restaurants and bars, and correctional facilities).
- “Low” exposure risk hazards and job tasks are those that do not require contact inside six feet with persons known to be, or suspected of being, infected with COVID-19.
- Inform employees of the methods of self-monitoring for signs and symptoms of COVID-19 and encourage employees to self-monitor;
- Develop and implement policies for employees with symptoms consistent with COVID-19 and no alternative diagnosis has been made;
- Establish a system to receive positive COVID-19 tests by employees and for employer tenants to inform, among others, building/facility owners of two positive COVID-19 tests for any employees or residents in a building so the building/facility owner can sanitize common areas of the building; the Virginia Department of Health; and, in the event of three or more employees present at the place of employment within a 14-day period testing positive for COVID-19 during that 14-day period;
- Provide notice to specific individuals who could have been in contact with an infected employee in the event of a positive test for one if its employees, subcontractors, temporary employees, or other person who was present at the workplace within the previous 14 days from the date of the positive test; and

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- Develop and implement policies and procedures for employees to return to work after testing positive for COVID-19 (whether the employee had symptoms or was asymptomatic) and employees who are suspected to have had COVID-19.

To the extent feasible, all employers must ensure employees maintain physical distancing while working and during paid breaks and provide employees with appropriate personal protective equipment (PPE). Employers must also close or control access to common areas, breakrooms, and lunchrooms.

Employers who classify hazards or job tasks as “very high,” “high,” or “medium” are required to implement, to the extent feasible, certain engineering, administrative, and work practice controls to minimize potential exposure to COVID-19. Further, employers who classify hazards or job tasks as “very high” or “high” exposure risk as well as those who classify hazards and job tasks as “medium” exposure risk with 11 or more employees shall develop and implement a written Infectious Disease Preparedness and Response Plan and train employees classified as “very high,” “high,” or “medium” on the plan. The Plan must, among other things, designate a person responsible for the Plan and consider contingency plans for situations that may arise as a result of a COVID-19 outbreak.

The COVID-19 Standard also requires employers with hazards or job tasks classified as “very high” or “high” exposure risk at a place of employment to provide training to all employees at the workplace regardless of risk classification on the hazards and characteristics of COVID-19. The training requirement will take effect 30 days after the COVID-19 Standard becomes effective. Employers with job tasks at “lower” risk must provide written information to employees who perform those tasks regarding the hazards, characteristics, and symptoms of COVID-19. The Virginia Department of Labor will develop this written information, and employers may use it to comply with this requirement.

Finally, the COVID-19 Standard prohibits employers from discriminating or retaliating against an employee who wears their own PPE or raises a reasonable concern about infection control related to COVID-19.

Employers in Virginia should review the COVID-19 Standard and use it as a guide when drafting and implementing policies and procedures related to reopening their places of employment and COVID-19 generally. Virginia employers that fail to comply with the COVID-19 Standard are

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subject to fines up to \$12,726 for serious violations and \$127,254 for willful violations.

National Law Review, 16 July 2020

<https://www.natlawreview.com/article/virginia-becomes-first-state-to-adopt-covid-19-related-workplace-health-and-safety>

EUROPE

Ethanol in the Netherlands must be labelled as carcinogenic and reprotoxic

2019-02-01

As determined by the Ministry of Social Affairs and Employment in the Working Conditions Decree and SZW list of carcinogenic substances and processes, ethanol is regarded as a carcinogen in the Netherlands, but not considered so in the other European countries.

toxic.nl, 1 February 2019

<https://www.toxic.nl/nieuws/ethanol-welke-wettelijke-verplichtingen-zijn-van-toepassing>

More toxic lead fell from Notre Dame fire than originally reported

2020-07-11

The tragic Notre Dame cathedral fire last year produced more lead fallout than was initially reported by French authorities, potentially putting nearby residents at risk, new research suggests.

On 15 April 2019, the roof and spire of Paris's iconic Notre Dame cathedral caught fire and collapsed, in an event that shocked the world. Around 460 tonnes of lead covered the cathedral in the form of lead roof tiles and other building materials, leading to concerns that some of this toxic metal, made airborne by the fire, might have rained down onto surrounding neighbourhoods.

French officials said the amount of lead that had fallen near the cathedral hadn't accumulated to dangerous levels. New **research** published in GeoHealth is contradicting this claim, finding lead fallout near the cathedral at levels well above the country's safety limit.

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After the fire, the Regional Health Agency of France measured soil near the cathedral, finding levels of lead below 300 milligrams per kilogram (mg/kg), which is the country's acceptable limit. This caused a bit of upset in France, as some people thought officials were downplaying the health risks.

"There was a controversy – were children being exposed or not from this fallout?" said Alexander van Geen, the lead author of the new paper and a geochemist at Columbia University, in a **press release**. "So I thought, whether I get a 'yes' or a 'no', it's worth documenting."

Lead is a neurotoxic metal that's particularly dangerous to children. The US Centers for Disease Control (CDC) **says** kids normally become exposed by eating or chewing lead-based paint chips or objects covered in lead-based paint, or by ingesting house dust or soil contaminated with lead.

"Once it enters the body, lead can become a health hazard. Lead can affect almost every organ and system in the body, especially the nervous system," **according** to the CDC. "It can cause learning disabilities and behavioural problems. At very high levels, it can cause seizures, coma, and even death. Lead poisoning frequently goes unrecognised because it often occurs with no obvious symptoms."

The goal of the study was to determine the extent to which people in Paris were exposed to lead as a result of the cathedral fire. To that end, soil samples were collected in all directions around Notre Dame. The researchers collected 100 soil samples within a 0.6 mile radius (1 kilometre) of the cathedral, in December 2019 and again in February 2020.

"It wasn't a particularly glamorous expedition," explained van Geen. "I got plenty of strange looks from people wondering why this old guy was scooping up soil, trying to avoid the dog poo, and putting some of the soil in paper bags. But it got done."

Normally, soil should have lead at less than 100 mg/kg, but the samples in the study area were found to contain 200 mg/kg. Downwind of the fire, to the northwest of the cathedral, these levels were more than twice as high, registering 430 mg/kg of lead, which is well above France's 300 mg/kg safety limit. Around 2,200 pounds of lead (1,000 kg) likely settled within the study area after the fire, according to the researcher's models.

"Although the estimated amount of lead redeposited within 1 km corresponds to only a small fraction of the total covering the cathedral,

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it could have posed a health hazard to children located downwind for a limited amount of time,” wrote the authors in the study.

Study co-author and statistician Yuling Yao, also from Columbia University, said in the press release these findings should be “validated by more data, especially when they have profound policy and public health consequences,” to which he added: “I hope our work sheds some light in that direction.”

Larger environmental tests should have happened after the fire, the authors conclude. This would have offered a more timely assessment of the situation, alerting health officials to the danger. In turn, they could have warned people in the affected areas, advising residents to wipe away indoor dust and prevent children from playing in the soil, among other safety measures.

Gizmodo, 11 July 2020

<https://www.gizmodo.co.uk/2020/07/more-toxic-lead-fell-from-notre-dame-fire-than-originally-reported/>

Dutch biocides authority open to extending dossier deadlines

2020-07-15

The Dutch competent authority (CA) for biocides (Ctgb) has become the first member state authority to agree to extend the deadlines for dossiers in light of the Covid-19 crisis.

In an announcement published on 1 July, the CA acknowledged that there could be associated delays in compiling dossiers for biocidal substances and product authorisations.

It suggests companies apply for an extension to the submission deadlines for their dossiers if the reasons are “thoroughly substantiated and related to Covid-19”.

The applicant must explain why and how much extra time they need, “preferably” with supporting documentation from testing laboratories, and what actions they have already taken to prevent or limit the delay.

Ctgb’s announcement follows concerns that data collection may come up against full capacity at testing laboratories, which are prioritising Covid-19 work, including testing disinfectants for their efficacy against the virus.

It suggests companies apply for an extension to the submission deadlines for their dossiers if the reasons are “thoroughly substantiated and related to Covid-19”.

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Extensions will be granted “only once and for a short period” of one or a few months, the CA said.

The Netherlands is the first member state authority to have come forward with an official statement on extending deadlines for biocides dossiers, Chemical Watch understands.

Consultancy Arche says its attempts to apply for deadline extensions with other member state authorities have been unsuccessful, although it expects CAs could be open to accommodating applicants that have proof that their chosen laboratory cannot finish testing in time because of capacity constraints.

“It might be case-specific, but we are happy to see Ctgb putting out a formal statement and hope that others will follow,” said Arche consortium manager, Katinka Renoult and senior project scientist, Barbara Dhoop.

“There is clearly a need for it, especially with labs being busy testing disinfectants.”

An overarching approach for deadline extensions from the European Commission has, so far, not been developed. However, Echa announced in March that it would extend some deadlines to help companies.

Chemical Watch, 15 July 2020

<https://chemicalwatch.com/134667>

INTERNATIONAL

Study: Disposal of PFAS waste increases contamination

2020-07-15

In a study published in the peer-reviewed journal *Chemosphere*, scientists at the Environmental Working Group conclude that burning, discarding and flushing waste containing the toxic fluorinated chemicals known as PFAS all contribute to environmental contamination. The three standard practices for waste management outlined in the review – landfilling, wastewater treatment and incineration – do not effectively contain or destroy PFAS.

“The three common ‘disposal’ options for getting rid of PFAS do not eliminate these contaminants but rather end up just returning either the same chemicals or their byproducts back into the environment,” says Tasha

The three standard practices for waste management outlined in the review – landfilling, wastewater treatment and incineration – do not effectively contain or destroy PFAS.

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Stoiber, Ph.D., EWG senior scientist and primary author of the study. "PFAS disposal is really just another step in the contamination cycle."

Communities with contaminated water supplies increasingly look to PFAS treatment technologies, but every technology produces PFAS-laden waste. With current disposal options, the concentrated PFAS likely returns to the environment, to require removal once more. As the need to dispose of this waste grows, handling of PFAS waste at disposal sites has received more scrutiny.

PFAS are discharged by industrial facilities, released by airports and military bases using PFAS-containing firefighting foams, and sent to landfills or flushed down drains following their use in a multitude of consumer products. Vast stores of legacy firefighting foam are being sent to incinerators that are **suspected of spreading** the contamination to local communities. In the absence of federal regulations, PFAS receive no special treatment during the disposal process. There is no requirement to monitor for PFAS in waste streams. Contamination moves from site to site as a result, contributing to the ever-increasing list of **contaminated communities**.

Mapping the full PFAS contamination cycle, including what happens after disposal, is of critical importance. **PFAS** are called "forever chemicals" because they never break down in the environment and could move through the cycle indefinitely. These chemicals might **suppress the immune system** and are associated with cancer, **reproductive and developmental harms**, and **reduced effectiveness of vaccines**, among other health problems.

"The disposal of PFAS can cause environmental pollution, which disproportionately affects people and communities near the waste disposal sites," says Olga V. Naidenko, Ph.D., vice president for science investigations at EWG. "States, the EPA and waste management companies must take strong action to protect fence-line communities from harmful exposures to PFAS."

The paper concludes with six measures for addressing the PFAS problem:

- Limiting the use of PFAS to essential applications in order to reduce industrial discharges.
- Protecting the health of fence-line communities through strong public health policies.
- Capturing all liquid wastes from landfills and keeping them on site.

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- Monitoring PFAS contamination at and near disposal sites.
- Researching PFAS incineration to address current data gaps.
- Researching advanced remediation technologies to generate new waste management solutions.

EWG, 15 July 2020

<https://www.ewg.org/release/study-disposal-pfas-waste-increases-contamination>

Chemical companies say ChemScore doesn't present 'full picture'

2020-06-26

Some chemical companies ranked in NGO ChemSec's recently launched ChemScore, have said there are "shortcomings" in the assessments and that they do not present the "full picture" of a company's safe management of chemicals.

ChemScore – launched on 16 June – ranks chemical companies against four criteria, largely looking into their efforts to reduce the production of hazardous chemicals and increase investments in "safer, greener alternatives".

Chemical Watch contacted all 35 companies to ask for responses to their individual rankings and the criteria to assess them. Nine companies responded by the time of publishing.

Most argued the hazard assessment of a company's product portfolio did not provide a full picture because other sustainability factors – and how the risks of hazardous chemicals are managed – were not considered.

Covestro, which received 18 of a possible 48 points, said that while it "recognises the hazards of chemicals, we consider it only one aspect of a comprehensive risk management". And Ecolab, which received 14 points, said the rankings "do not reflect a total impact view or how the chemistries are consumed or what the societal benefits are".

However, Chemsec's Sonja Haider said carbon disclosure as well as water, waste and emissions are now often included in sustainability reporting and so "we didn't want to duplicate existing rankings and evaluations ... and focused solely on chemical practices".

She added that risk management is expensive and "can be very complex and is by no means foolproof". "When products are used in unintended

Most argued the hazard assessment of a company's product portfolio did not provide a full picture because other sustainability factors – and how the risks of hazardous chemicals are managed – were not considered.

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ways or without the required protection, these predictions fail to fulfil their purpose, which is to protect human health and the environment," she said.

Evonik, which received 13 points, said there are "shortcomings" in how companies were scored, highlighting, for example, the "double negative scoring" for substances on ChemSec's Substitute It Now (SIN) list and the EU REACH candidate list.

Full Article

Chemical Watch, 26 June 2020

<https://chemicalwatch.com/129355/>

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Restriction and authorisation found to drive replacement of harmful chemicals

2020-07-08

ECHA/NR/20/25

Replacing harmful chemicals with safer alternatives and greener technologies is strongly driven by regulation, with companies reporting that restrictions and authorisation are their main drivers for substitution. Companies are also motivated by customer demand and their own sustainability policies, with ECHA's substitution strategy also indirectly boosting substitution activities.

Helsinki, 8 July 2020 – While restrictions and authorisation directly encourage European industry to substitute harmful chemicals, ECHA's support for substitution has also played a role. ECHA's two published reports uncover both the direct and indirect effects of REACH in driving substitution.

Based on a survey of industry associations and more than 80 companies, many of which were affected by authorisation or restriction, around 19 % indicated that restriction is their main reason for replacing hazardous chemicals with safer alternatives.

Adding a substance to the Candidate List or Authorisation List were the next most significant triggers for companies, with authorisation selected by 15 % of the companies responding. Some companies have reportedly substituted when a regulatory management option analysis (RMOA) was still under development, and especially when the assessing Member State had, following the outcome of the RMOA, proposed a further regulatory risk management activity, such as identification of substances of very high concern.

Aside from regulation, companies also highlighted demands from their customers, enhancing their public image and adopting their own corporate sustainability policies as their main drivers to substitute hazardous substances with safer alternatives.

"It's clear that the most innovative companies are those that have adopted a green mindset, with substitution at the core of their business activities. While regulation pushes for harmful substances to be replaced, moving away from them is also increasingly becoming an essential part of their corporate policies and the way towards a sustainable and greener Europe in the future," says *Bjorn Hansen*, ECHA's Executive Director.

Based on a survey of industry associations and more than 80 companies, many of which were affected by authorisation or restriction, around 19 % indicated that restriction is their main reason for replacing hazardous chemicals with safer alternatives.

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The report outlines a combination of technical, economic and market barriers that companies face when substituting – including difficulties in finding technically-feasible alternatives, a lack of financial incentive and a reduced competitive advantage. Companies do, however, see decreases in worker exposure and emissions to the environment as the main benefits of substitution.

ECHA's report on substitution-supporting activities with a focus on 2020-21 describes how ECHA has helped and intends to help companies overcome these barriers by:

- promoting training on analyses of alternatives to build organisations' capacity for informed substitution;
- supporting Member States and industry stakeholders to organise supply chain workshops addressing substances on the Candidate and Authorisation lists, those proposed for restriction, and for biocidal products containing substances that are suitable candidates for substitution;
- maintaining substitution-related networks and promoting the concept of safe-by-design to enhance knowledge sharing, communication and coordination among stakeholders in the EU on these topics; and
- contributing to the OECD's work on a guidance on safer alternatives to further support the EU's work on substitution, including on the broader concept of sustainability.

Background

The progressive substitution of substances of very high concern (SVHCs) with suitable alternatives is one of three key objectives of the REACH authorisation title. The others are making sure that the risks to human health and the environment are properly controlled and ensuring the good functioning of the internal market.

When there is an unacceptable risk to human health or the environment, arising from the manufacture, use or placing on the market of substances, a restriction can be adopted.

Substitution also contributes to the overarching EU objectives for a non-toxic environment and a circular economy by progressively replacing harmful substances with more sustainable alternatives.

The first of ECHA's new reports summarises the results of a survey on the impacts of REACH restriction and authorisation on substitution in the EU. This is complemented by another report on the implementation of ECHA's

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substitution strategy in the past two years and what ECHA will focus on in 2020-21, in addition to regulatory risk management. The two reports aim to show how substitution is driven both by regulatory action and by encouraging companies in an indirect manner.

ECHA, 8 July 2020

<https://echa.europa.eu/-/restriction-and-authorisation-found-to-drive-replacement-of-harmful-chemicals>

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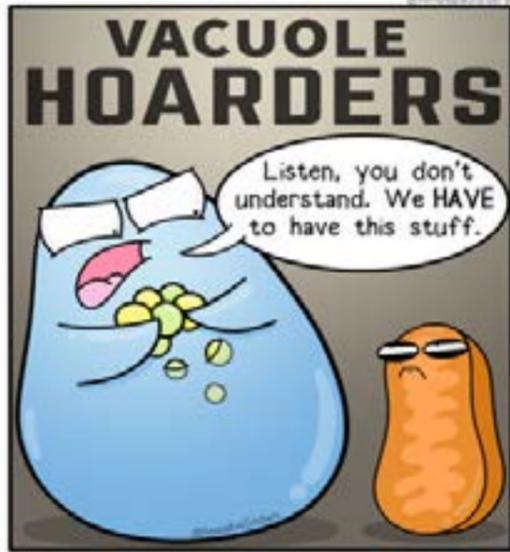
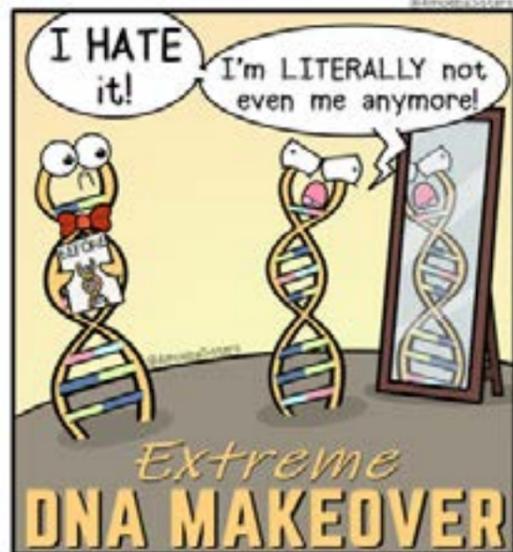
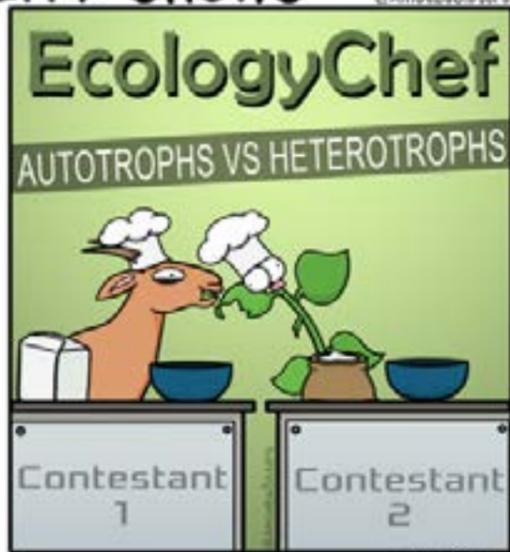
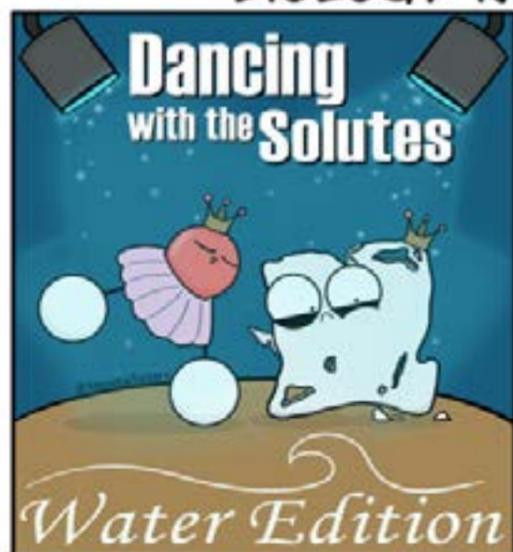
Cancelled biology reality shows

2020-07-24

CANCELLED

BIOLOGY REALITY SHOWS

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<https://www.amoebasisters.com/parameciumparlorcomics/previous/8>

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Hazard Alert

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Methyl Chloride

2020-07-24

Methyl chloride—aka chloromethane—is a clear, colourless, and highly flammable gas. It is a naturally occurring ubiquitous gas, that has a faint, but sweet odour. Its chemical formula is CH_3Cl . [1,2,3]

USES [1,3]

Methyl chloride is used across various industries. In the past it was used as a refrigerant and an anaesthetic. It is now used in the manufacture of silicone polymers, and as a methylating agent to attach CH_3 to oxygen and nitrogen. Methyl chloride is also used as a solvent.

ROUTES OF EXPOSURE [4,5]

- The primary route of exposure for methyl chloride is via inhalation.
- Methyl chloride is made in the ocean by natural processes, meaning that it is present in the air all over the world.
- The outside air contains less than 1ppb of methyl chloride
- Those who are most likely to be exposed to the chemical in the air are those who work in chemical plants where methyl chloride is being used.

HEALTH EFFECTS

Methyl chloride poisoning affects a range of systems including the integumentary and nervous systems.

Acute Effects [6]

Severity of symptoms depend on the level and type of exposure.

- Acute methyl chloride poisoning can result in vomiting and convulsions, followed by an apparent recovery and then recurrence of these symptoms.
- Other symptoms include: nausea, diarrhoea, abdominal pain.
- Dermal exposure can cause irritation, vesiculation and erythema.
- Dermal exposure to the liquid form of the chemical can result in frostbite.
- Heavy, but acute poisoning can cause CNS depression, headaches, dizziness, weakness or paralysis, pulmonary oedema, drowsiness and a coma or death.

Methyl chloride—aka chloromethane—is a clear, colourless, and highly flammable gas.

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Chronic Effects [6]

Methyl chloride is toxic to multiple body systems. Long-term exposure to the chemical can result in blurred vision, confusion, numbness of extremities, ataxia, tremors, confusion and hallucinations. Symptoms of long-term poisoning can last several months.

SAFETY

First Aid Measures [7]

- Ingestion: Ingestion is not considered a potential route of exposure. However, if this chemical is ingested, DO NOT INDUCE VOMITING, and immediately contact a medical professional.
- Skin contact: The liquid form of this chemical may cause frostbite. For exposure to the liquid form, warm frostbitten area with water that does not exceed 41°C . Maintain skin temperature for at least 15 minutes, or until normal look, touch and temperature have returned. If there is heavy exposure, remove clothing while showering with warm water. Immediately contact a healthcare professional.
- Eye contact: Rinse eyes carefully with water for at least 15 minutes, ensuring to hold both eyelids open so they are flushed thoroughly. Contact an ophthalmologist immediately.
- Inhalation: Take victim to the nearest fresh air source and monitor their breathing. If they are not breathing, and you are qualified, you can administer CPR—with a pocket mask or one-way valve. Immediately contact a medical professional.
- General: Never administer anything by mouth to an unconscious, exposed person.

Exposure Controls/Personal Protection [7]

- Engineering controls: Emergency eyewash fountains and safety showers should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation. Only use in conjunction with an explosion-proof local exhaust system, e.g. a fume hood.
- Personal protection: Safety glasses, protective and dustproof clothing, gloves, an apron and an appropriate mask. Follow the PPE guidelines set in your jurisdiction.

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REGULATION [8]

United States:

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average (TWA) concentration limit for methyl chloride of 100ppm.

Australia [9]

Safe Work Australia has set an 8-hour time TWA for ethyl chloride of 20ppm. They have set a Short Term Exposure Limit (STEL) of 80ppm.

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Hummingbirds can count their way to food

2020-07-07

Tiny, feisty rufous hummingbirds are known for their long migrations, which take them up and down the length of North America each year. Now, they have a new claim to fame: They can keep track of particularly juicy flowers depending on where they appear—first, second, or even fourth—in a line-up of blooms. Although this understanding of “numerical order” may sound simple, it’s a complex skill that may help hummingbirds remember the easiest routes between nectar-rich flowers. It’s also the first time researchers have seen the ability in a wild vertebrate.

It’s a “really impressive” study says Stuart Watson, an animal cognition researcher at the University of Zürich who was not involved with the work.

Lots of animals can count, and some can understand how things fit together in a sequence. For example, rats, guppies, and monkeys trained in a lab can all use sequences to find food. But this doesn’t tell us whether—or how—wild animals might use that ability in a natural setting.

So Susan Healy, a biologist at the University of St. Andrews, and colleagues turned to rufous hummingbirds (*Selasphorus rufus*). The rust-colored males of the species, which weigh less than a nickel and are just 8 centimeters long, have well-defined feeding territories and excellent memories of what’s on their turf. “They would never lose the car in the car park,” Healy says.

The birds also use efficient routes to head from one nectar-rich flower to another, much like a shopper carefully planning the best route through a grocery store. Healy’s team wanted to find out how they create these routes: Do they simply move from one visual target to the next that’s in sight? Or do they learn a sequence, knowing which items follow the current one?

To find out, the researchers set up feeders with a nectarlike syrup in a valley in North America’s Rocky Mountains, just in time for the hummingbirds to start arriving in May. Once they saw that a bird was consistently eating from a certain feeder (and defending his territory from other birds), the scientists trapped and marked him for identification. Then they trained nine marked hummingbirds to feed from an artificial “flower”—a yellow foam disc on a wooden stake, with a syrup-containing tube in the center.

Now, they have a new claim to fame: They can keep track of particularly juicy flowers depending on where they appear—first, second, or even fourth—in a line-up of blooms.

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To see whether the animals had a sense of numerical order, the researchers lined up 10 identical artificial flowers. They put syrup in the first flower and watched to see where the hummingbirds went to feed. Unsurprisingly, the birds went almost uniformly to the first flower, sometimes giving the others a quick check to see whether they also held a tasty treat.

Then, the team began rearranging the flowers after each visit, mixing them up—and even moving the entire line—so that the position of the flowers couldn't give the birds information about which flower had the syrup. Even then, the birds chose the first flower in the line, suggesting they had a concept of "first." And when the team repeated the entire experiment but baited, say, the third flower, the birds usually zoomed straight toward the third flower. This suggests they knew the third flower in line—regardless of where the line actually was—had the treat.

In all, the findings suggest the hummingbirds have a conception of numerical sequence—and that they can use it to efficiently find food, the team reports today in the *Proceedings of the Royal Society B*.

"It's an ambitious study," says Andreas Nieder, a neurobiologist at the University of Tübingen who studies animal number cognition. But, he adds, the results don't eliminate another possibility: that the birds were using other information to find the flower. It's also possible that different birds used different strategies, he says. Perhaps some hummingbirds, like humans, have an easier time wrapping their heads around numbers.

sciencemag.org, 7 July 2020

<https://www.sciencemag.org>

Beyond the "silver lining" of emissions reductions: Clean energy takes a COVID-19 hit

2020-07-09

In early March, the Washington state legislature passed a community solar incentives bill meant to help meet renewable energy goals and increase low-income communities' access to solar technology.

The bill, HB 2248, enjoyed widespread stakeholder support; environmental justice groups, renewable energy coalitions, and utility companies were all on board.

The day after the bill passed, Washington Governor Jay Inslee shut down public schools in response to the escalating COVID-19 pandemic. Over the next few weeks, as businesses were shuttered, and a stay-at-home

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order was issued and then extended, it became increasingly clear that the pandemic would not be easily contained and that the loss to human life and economic stability would be far-reaching.

In early April, the governor vetoed HB 2248, citing the state's economic fallout.

"Funding in the state budget really needed to go toward the most essential state services," the bill's main sponsor, Representative Beth Doglio (D-Olympia), told EHN. "Unfortunately, the governor did not consider...the community solar bill to be something that we should be investing in right now."

The fate of the Washington state solar bill is a microcosm of what economists and industry groups say is a profound and nationwide disruption to renewable energy development and progress toward greenhouse gas emissions reductions goals. In stark contrast to the "silver lining" stories of short-term emissions reductions related to stay-at-home orders, experts say that job losses and declining investments are hampering U.S. strides toward a clean energy future.

Even so, they say the disruption is an opportunity to invest more conscientiously in renewable infrastructure.

Investment declines

A team of researchers, led by Yale economist Kenneth Gillingham, attempted to quantify the impact of the COVID-19 related disturbances to renewable energy investments on long-term greenhouse gas emissions.

"We were seeing these declines in air pollution and improvements in air quality when the lockdowns occurred. And a lot of articles about this... 'silver lining', if you will," Gillingham told EHN. "But I was also recognizing that the pretty substantial innovation we've been seeing in clean energy over the past few years is being slowed."

Assuming delayed investments parallel those of the last significant recession between 2007-2009, Gillingham's team estimated that the result of a COVID-19 related recession would be an additional 2,500 million metric tons of carbon dioxide released between 2020 and 2035.

This far outpaces the shutdown-related emissions reductions and is the equivalent of burning 5.79 billion barrels of oil.

The team's report predicted that smaller, less established renewable energy businesses may be forced to close, and others, such as automotive

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companies, would slow or suspend development and production of clean energy technology as the market declines. Public electric car charging station construction could also be slowed.

By the end of 2020, global electric vehicles sales are expected to contract to 43 percent of 2019 levels. Further, as Americans face reduced or eliminated incomes, they are less likely to invest in rooftop solar or make energy efficiency modifications to their homes.

"Anytime that there's a vast amount of uncertainty...you're much more likely to see investments decline," said Gillingham. "It's hard to focus on new products and new technologies for five years from now, when you're just hoping to make it to tomorrow."

Job loss

Clean energy workers are already feeling the slump.

In a June 15 analysis, the BW Research Partnership, a company that tracks business trends, reported that 620,590 U.S. renewable energy employees have lost their jobs since the pandemic began.

This loss represents 18 percent of the industry.

The report emphasizes that many companies were able to avoid layoffs due to the Paycheck Protection Program (PPP), a federal program that grants forgivable loans to small companies to help them retain employees during COVID-19 related shutdowns.

However, the report cautioned that another round of layoffs may occur when the PPP expires. On June 30, hours before the PPP was set to end, Congress extended it to August 8.

A&R Solar, a small business but one of the Pacific Northwest's largest solar installers, has thus far been able to weather the storm, but not without injury.

"Early on, we did know that we were going to be forced to lay off, permanently, a handful of people. Some had just gotten hired on to the sales team and we just knew that it was not going to be a growth year in sales," CFO Dave Kozin told EHN. "Thankfully, everyone was at least eligible for unemployment."

Washington state was one of the hardest hit for clean energy job losses since the pandemic began, with 21,242 people losing work, according

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to the BW Research Partnership report. Other hard hit states include California and Georgia with 109,712 and 28,932 job losses, respectively.

Kozin said that the PPP was instrumental in floating the company during Washington state's shutdown. Once the company was able to get back to work, they had a backlog of projects to work through even while sales had slowed.

"We feel somewhat confident that we'll be able to keep all of our employees busy through the end of the year," he said. "Once we're back into January, February, if we're still looking at lockdowns and a lot of economic uncertainty, it could be a really tough first quarter for us in 2021."

Efficiency sector hit hardest

The Solar Energy Industries Association (SEIA), a U.S. trade group that lobbies for solar to meet 20 percent of U.S. energy needs by 2030, reported that the job losses caused by the pandemic have undone five years' worth of industry gains, with 38 percent fewer workers employed than forecast before COVID-19.

Likewise, new solar installation is 37 percent below projection for 2020, a number that represents a loss of infrastructure that could power 288,000 homes and an economic investment of \$3.2 billion, according to SEIA.

Sean O'Leary, communications director at the NW Energy Coalition, an organization of 100 independent entities working toward renewable energy development in the Pacific Northwest, agreed that small solar companies had taken hits across Washington and also emphasized the losses in the energy efficiency sector.

"Most energy efficiency jobs happen in local communities with local businesses: heating, ventilating and air conditioning contractors, lighting contractors, places like that," O'Leary told EHN.

O'Leary said that energy efficiency contractors have become the "cutting edge" of clean energy because building and system improvements lead to dramatic reductions in overall energy requirements.

"Everybody's familiar with solar and wind. You can see the panels and you can see the turbines. But energy efficiency, actually, both in terms of the volume of clean energy that it provides, and also in terms of employment is by far the largest sector," said O'Leary. "And it also, for the same reasons as solar, is taking a pretty severe blow right now."

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The BW Research Partnership report names the energy efficiency industry as having had the heaviest losses: roughly 431,800 jobs across the United States, representing seven out of 10 clean energy jobs lost.

“Policy action could change the whole story”

Despite the bleak picture painted in his study and corroborated by other reports, Gillingham said that policy intervention “could make a pretty massive difference.”

“When you’re hitting a situation like this one, where policymakers recognize that something needs to be done, that many millions of people are jobless, and they’re willing to consider stimulus packages, there’s a lot of room for the stimulus packages to be oriented towards long-term clean energy investments,” said Gillingham.

“If there’s substantial investment in clean energy, besides obviously creating jobs at a time when you need them, you could also see benefits in the long run to the environment. Policy action could change the whole story,” Gillingham added

On July 1, the U.S. House of Representatives passed the *Moving Forward Act*, a bill intended to reestablish economic stability during the pandemic by investing in infrastructure and creating jobs. It has some provisions that support renewable energy development. Groups such as *SEIA* as well as *Greenpeace* and the *Sunrise Movement*, praised the effort as a step in the right direction, but the latter groups said much more investment was needed to secure a clean energy future.

In a *press release*, U.S. Senate Majority Leader Mitch McConnell opposed the bill, calling it “the cousin of the Green New Deal” and stating that “this nonsense is not going anywhere in the Senate.”

As Washington state stares down a nearly \$9 billion dollar COVID-19 related budget deficit through 2023, Representative Doglio says that, unless something changes, HB 2248, the community solar bill, is unlikely to be realized anytime soon.

“Revenue in this state is going to be a very hard thing to come by and [HB 2248] probably won’t rise up to a priority bill for a number of years,” said Doglio. “The only thing I could see is if the federal government has

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some sort of a stimulus package that gives money to the states to create renewable energy projects.”

ehn.org, 9 July 2020

<https://www.ehn.org>

COVID-19 has resurrected single-use plastics—are they back to stay?

2020-07-14

COVID-19 is *changing* how the U.S. disposes of waste. It is also threatening hard-fought victories that restricted or eliminated single-use disposable items, especially plastic, in cities and towns across the nation.

Our *research group* is analyzing how the pandemic has altered waste management strategies. *Plastic-Free July*, an annual campaign launched in 2011, is a good time to assess what has happened to single-use disposable plastics under COVID-19, and whether efforts to curb their use can get back on track.

From plans to pandemic

Over several decades leading up to 2020, many U.S. cities and states worked to reduce waste from single-use disposable objects such as straws, utensils, coffee cups, beverage bottles and plastic bags. Policies varied but included bans on *Styrofoam*, *plastic bags* and straws, along with taxes and fees on *bottles* and *cups*.

Social norms around plastic waste have evolved quickly in the past several years. Pre-COVID-19, “Bring your own” tote bags, mugs and other foodware had become part of daily life for many consumers. Innovative startups targeting reusable foodware niches include *Vessel*, which partners with cafes, enabling customers to rent stainless steel to-go mugs, and *DishCraft*, which picks up dirty dishes from dine-in restaurants and to-go food outlets, cleans them with high-tech equipment and returns them ready for reuse.

Just before COVID-19 lockdowns began in March 2020, the New Jersey senate *adopted a bill* that would have made the state the first to ban all single-use bags made of either paper or plastic. And U.S. Sen. Tom Udall of New Mexico and U.S. Rep. Alan Lowenthal of California introduced the *Break Free from Plastic Pollution Act* – the first federal measure limiting use of single-use disposable items.

By late June, cities and states had temporarily suspended almost 50 single-use item reduction policies across the U.S. – mainly bans plastic bag bans.

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COVID-19 shutdowns drastically changed all of this. In just a few weeks, plastic bags returned to grocery stores in states that had recently banned them. Even before lockdowns were official, restaurants and cafes started refusing personal reusables such as coffee mugs, reverting to plastic cups and lids, wrapped straws and condiment packets.

By late June, cities and states had temporarily suspended almost 50 single-use item reduction policies across the U.S. – mainly bans plastic bag bans. The pandemic also spurred demand for single-use personal protective equipment, such as masks and plastic gloves. These items soon began appearing in municipal solid waste streams and discarded on streets.

The plastic pandemic

With legislation restricting disposables suspended, many food vendors and grocery stores have shifted entirely to disposable bags, plates and cutlery. This switch has raised their operating costs and cut further into their already-low margins.

Grocery stores have sharply increased plastic bag usage. Households are generating up to 50% more waste by volume than they did pre-COVID-19. Anecdotal reports indicate that these waste streams contain more single-use disposable items.

The recycling industry has weighed in on the impacts of more single-use bags and higher residential waste volumes. Waste industry workers, who have been uniformly declared essential, work in closed spaces with many other people, so even if surface transmission of coronavirus is not a serious risk, the pandemic has increased person-to-person transmission risks in the waste industry.

Hygiene: A red herring

The main rationale that states, cities and vendors have offered to justify switching from reusables back to disposables is hygiene. Plastic packaging, the argument goes, protects public health by keeping contents safe and sealed. Also, discarding items immediately after use protects consumers from infection.

This narrative handily dovetails with the plastics industry's ongoing effort to slow or derail bans and restrictions. The industry has loudly supported turning the clock back toward single-use disposable products.

In a March 2020 letter to the U.S. Department of Health and Human Services, the Plastics Industry Association argued that single-use items

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were the “most sanitary” option for consumers. Industry representatives are actively lobbying against the Break Free From Plastics Act.

However, studies show that these products are not necessarily safer than reusable alternatives with respect to COVID-19. The virus survives as long on plastic as it does on other surfaces such as stainless steel. What's more, studies currently cited by the plastics industry focus on other contaminants such as E.coli and listeria bacteria, not on coronaviruses.

Viewed more holistically, plastics generate pollutants upstream when their raw materials are extracted and plastic goods are manufactured and transported. After disposal – typically via landfills or incineration – they release pollutants that can seriously affect environmental and human health, including hazardous and endocrine disrupting chemicals.

All of these impacts are especially harmful to minority and marginalized populations, who are already more vulnerable to COVID-19. In our view, plastic goods are far from being the most hygienic or beneficial to public health, especially over the long term.

Building resilience

Crises like the COVID-19 pandemic make it hard to see the bigger picture. No longer having to remember reusable tote bags or coffee mugs can be a relief. But the quick return of single-use disposable products shows that recent restrictions are precarious, and that industries don't cede profitable markets without a fight.

Waste reduction advocates, such as Upstream Solutions and #BreakFreeFromPlastic, are working to gather data, educate the public and prevent decision-making about plastics that is based on perception rather than scientific reasoning. On June 22, 115 health experts worldwide released a statement arguing that reusables are safe even under pandemic conditions.

Some governments are taking notice. In late June, California reinstated its statewide ban on single-use plastic bags and requirement for plastic bags to contain 40% recycled materials. Massachusetts quickly followed suit, lifting a temporary ban on reusable bags.

For the longer term, it is unclear how COVID-19 disruptions will affect consumerism and waste disposal practices. In our view, one important takeaway is that while mindful consumers are part of the solution to the plastics crisis, individuals cannot and should not carry the full burden.

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We believe that at the local and federal levels, policymakers need to build cross-jurisdictional alliances, recognizing shared interests with the waste management industry and emerging businesses like Vessel and Dishcraft. To make progress on reducing plastic waste, advocates need to reinforce measures in place before the next crisis hits.

theconversation.com, 14 July 2020

<https://www.theconversation.com>

TDMA members take legal action against EU's classification of Titanium Dioxide

2020-07-09

The member companies of the Titanium Dioxide Manufacturers Association (TDMA) submit an action in annulment to the General Court of the European Union against the harmonized classification of TiO₂ as a suspected carcinogen (cat 2.) by inhalation under the EU's Classification and Labeling (CLP) Regulation.

Requests for Annulment on Basis of Nonreliable Data

The appeal challenges the legality of the classification adopted by the

European Commission on 4 October 2019 and requests its annulment. The appeal demonstrates that there is no reliable, acceptable or available data to suggest that TiO₂ causes cancer. It also shows that the classification was adopted in breach of the Commission's duty of care and several principles of EU law, including the principles of legal certainty, proportionality and the right of interested parties to be heard.

The decision of the General Court is expected to take 2 to 3 years and therefore will be after the classification comes into force on 1 October 2021. In the meantime, TDMA and its members will focus on finding a way to implement the regulation from that date despite the uncertainties of the classification.

polymer-additives.specialchem.com, 9 July 2020

<https://www.polymer-additives.specialchem.com>

A heat wave thawed Siberia's tundra. Now, it's on fire

2020-07-06

For months, Siberia has been experiencing extreme heat due to a combination of persistent sunny weather and human-caused climate change. In addition to producing Arctic temperatures that cracked 100

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degrees in June, the heat has fueled an enormous outbreak of wildfires, including fires on tundra underpinned by permafrost—normally frigid soil that is likely becoming even less frozen this year.

This rash of fires on landscapes that are typically too cold, wet, and icy to burn is raising alarms for ecologists and climate scientists, who fear it's yet another sign that the Arctic is undergoing rapid changes that could tip off a cascade of consequences both local and global.

If fire becomes a regular occurrence on Siberia's thawing tundra, it could dramatically reshape entire ecosystems, causing new species to take over and, perhaps, priming the land for more fires. The blazes themselves could also exacerbate global warming by burning deep into the soil and releasing carbon that has accumulated as frozen organic matter over hundreds of years.

"This is not yet a massive contribution to climate change," says Thomas Smith, an environmental geographer at the London School of Economics who has been tracking the Siberian fires closely. "But it's certainly a sign that something different is happening."

Siberia is no stranger to large summertime wildfires, including fires north of the Arctic Circle in the region's expansive boreal forests. But so far, 2020 has been a banner year for fire in the Russian Arctic.

Mark Parrington, a senior scientist with the European Center for Medium-Range Weather Forecasts, says that the fires started to spread across Siberia around the middle of June. Daily levels of "fire radiative power," a measure of the fires' heat output, rival those seen in 2019 (another extreme fire year) and far exceed anything else the Arctic has experienced since at least 2003. Russia's Forestry Agency estimates that millions of acres of land have gone up in flames in eastern Siberia's Sakha Republic, Chukotka, and Magadan regions.

In addition to flames being extremely intense and widespread, scientists are struck by how far north fires are burning and the types of ecosystems that are igniting. Smith has been investigating this using a combination of land cover maps and satellite data. He's found that in addition to the huge number of fires scorching northern boreal forests, many are burning even further north on the tundra and in carbon-rich peatlands. In all cases, the ecosystems that are burning sit atop frozen soils that comprise permafrost.

The appeal demonstrates that there is no reliable, acceptable or available data to suggest that TiO₂ causes cancer.

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While tundra fires are not unprecedented—scientists have documented a handful of large ones on Alaska’s North Slope in recent history—it’s unusual to see so many at once over such a large area, Smith says.

Several of the fires might even be setting geographic records. In late June, the European Space Agency’s Sentinel-2 satellite detected a series of fires at latitudes close to 73 degrees north—the northernmost fires in records going back to 2003, according to satellite remote sensing expert Annamaria Luongo. The most recent one, spotted by Sentinel-2 on June 30, flared up just a few miles from the shores of the Laptev Sea, a part of the Arctic Ocean.

“I was a little shocked to see a fire burning 10 kilometers south of a bay of the Laptev Sea, which is like, the sea ice factory of the world,” says Jessica McCarty, a fire researcher at Miami University in Ohio. “When I went into fire science as an undergraduate student, if someone had told me I’d be studying fire regimes in Greenland and the Arctic, I would have laughed at them.”

Heat is the underlying cause of these fires. Since December, temperatures across Siberia have been way above normal due to a persistent ridge of high pressure air parked over the area that has produced warm, sunny weather, melting the snowpack early. The heat has backed off slightly since mid-June, when the Siberian town of Verkhoyansk experienced a record-breaking 100-degree day, but it’s far from gone: The same day that a fire was spotted on the shores of the Laptev Sea, air temperatures in the area reached 94°F.

“To me what’s really shocking is how warm it’s been relative to average for so many weeks and months,” says Zack Labe, a climate scientist at Colorado State University.

All of this is on top of the long-term, climate change-driven warming trend, which is causing the Arctic to heat up at more than twice the globally averaged rate.

McCarty says the hot, dry weather likely dried out tundra vegetation, priming it to burn. Layers of partly decomposed organic material on the ground, called duff, have been warming and drying too. Smith suspects that the recent heat has also caused some additional thawing and drying deeper down in the permafrost, which contains a seasonally thawing “active layer” atop soil that typically remains frozen year round. “The heat wave just really brings everything up to a level where it can burn,” he says.

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Unlocking the carbon

A key concern of Arctic scientists is that some of these fires are burning not just across the surface of the tundra, but also down into the soil, through layers of carbon-rich organic matter accumulated over many centuries.

“By how big they are and how hot they are, I would say there’s no way they’re not burning down,” says Amber Soja, an associate research fellow with the National Institute of Aerospace and an expert on Siberian wildfires. As the fires eat their way underground, climate-warming greenhouse gases are released into the atmosphere, ultimately triggering more Arctic warming and more permafrost thaw. More immediately, ground fires give off heat, which can drive additional thawing and burning of the permafrost, Soja says.

While it’s unclear how much carbon is being released by this year’s fires or how much permafrost is thawing because of them, scientists are keen to investigate these questions. Longer term, the fires might also degrade the permafrost by removing upper layers of soil that act as an insulating barrier, a process that has been well documented in boreal forests. Permafrost deterioration can cause the ground to collapse in on itself and melted ice to pool up on the surface in lakes, something scientists witnessed in the wake of a large tundra fire on Alaska’s North Slope in 2007.

How these fires alter the Arctic’s delicate ecological balance is another important question to be answered. Soja says that severely scorched boreal forests sometimes transform into “pyrogenic tundra” after a fire kills off the trees and burns out the seeds stored in the soil, allowing grasses to take over. Fires on land that was already tundra, meanwhile, can sometimes make it easier for shrubs to take root, darkening the landscape, which absorbs more heat and makes it more fire prone in the future. And as climate change keeps encouraging the treeline to creep north, even more fire fuel is being added to Arctic landscapes.

“In terms of ecology, I don’t know what’s going to happen,” Soja says. “This is pretty far north. I think the damage is extensive. And I think it will take a long time [to recover]. Maybe not at all.”

[nationalgeographic.com](https://www.nationalgeographic.com), 6 July 2020

<https://www.nationalgeographic.com>

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EU inspectors to check plastics and rubber materials for hazardous substances

2020-07-08

ECHA's Enforcement Forum has agreed that its major enforcement project planned for 2022 (REF-10) will focus on integrated checks of products for hazardous substances under REACH. Most of the products are expected to be consumer products.

Presence of Substances Like Phthalates to be Checked

The controls will also check whether products comply with restrictions for the presence of persistent organic pollutants defined under the POPs Regulation. Specific substances to be covered by these checks will be decided in 2021 and could potentially include for example phthalates or PFOS.

Enforcers will also check REACH duties for substances in articles requiring that information on substances of very high concern in products is being communicated in the supply chain.

Substances Under REACH and POPs to be Covered

These duties under REACH and POPs will be checked for specific types of material such as rubber, plastic or textiles. In this way each product can be controlled for several REACH or POPs requirements which will broaden the scope of controls and strengthen the protection of EU citizens and the environment. This enforcement project will be prepared in 2021, with inspections conducted in 2022 and the report expected at the end of 2023.

The Forum also set timelines for the pilot project on the classification of mixtures, which will focus on classification of detergents and cleaning products. The preparation for this project will start at the end of 2020, with inspections taking place in 2021 and 2022 and the report expected in 2023.

Ms Katja vom Hofe (Germany) was re-elected as the Forum's Chair and Ms Sinead McMickan (Ireland) as the Vice Chair. Mr Henrik Hedlund (Sweden) was also elected as the Forum's Vice Chair.

Specific substances to be covered by these checks will be decided in 2021 and could potentially include for example phthalates or PFOS.

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The Forum for Exchange of Information on Enforcement met virtually on 22-25 June 2020.

polymer-additives.specialchem.com, 8 July 2020

<https://www.polymer-additives.specialchem.com>

Protein from blood of exercising mice rejuvenates brains of 'couch potato' mice

2020-07-09

It's well established that exercise can sharpen the mind: People and mice who work out do better on cognitive tests, and elderly people who are physically active reduce their risk of dementia. Now, in a surprising finding, researchers report that blood from a mouse that exercises regularly can perk up the brain of a "couch potato" mouse.

This effect, traced to a specific liver protein in the blood, could point the way to a drug that confers the brain benefits of exercise to an old or feeble person who rarely leaves a chair or bed. "Can your brain think that you exercised, from just something in your blood?" asks aging researcher Saul Villeda of the University of California, San Francisco (UCSF), who led the rodent research.

The study grew out of research in Villeda's lab and others suggesting blood from a young mouse can rejuvenate the brain and muscles of an old mouse. Some teams have since claimed to find specific proteins that explain the benefits of this "young blood." Graduate student Alana Horowitz and postdoc Xuelai Fan in Villeda's group wondered whether exercise—not just youth—could confer similar benefits via the blood.

It was easy to enough to test: Put a wheel in a cage full of mice, and the mostly inactive animals will run for miles at night. The researchers collected blood from elderly or middle-aged mice that had an exercise wheel in their cage for 6 weeks and then transfused this blood into old mice without a wheel in their cage.

Couch potato mice receiving this blood eight times over 3 weeks did nearly as well on learning and memory tests, such as navigating through a maze, as the exercising mice. A control group of couch potatoes receiving blood from similarly old, nonexercising mice saw no boost. The rodents getting the blood from the active mice also grew roughly twice as many new neurons in the hippocampus, a brain region involved in learning

"Can your brain think that you exercised, from just something in your blood?" asks aging researcher Saul Villeda of the University of California, San Francisco (UCSF), who led the rodent research.

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and memory, Villeda's team reports today in *Science*. That change is comparable to what's seen in rodents that directly exercise.

The researchers then looked for proteins that go up in the blood of mice when they exercise and homed in an enzyme called glycosylphosphatidylinositol specific phospholipase D1 (Gpld1) that's made in the mouse's liver. When the scientists injected Gpld1's gene into the tail vein of couch potato mice, delivering it to their livers and thereby making the organs crank out the enzyme, the rodents' cognitive performance and brain neuron growth improved after 3 weeks by about as much as if they had received blood from exercising mice. The team also showed that Gpld1 blood levels were significantly higher in a group of elderly people who regularly exercised than in those who didn't, suggesting the mouse results may hold up in people.

The researchers couldn't find much Gpld1 in the brains of the exercising mice, however—it doesn't seem to cross the blood-brain barrier. Instead, its brain-boosting effects may derive from cleaving certain other proteins from the membranes of many types of cells. Those freed molecules then enter the bloodstream and lower inflammation and blood clotting, processes tied to dementia and cognitive decline in elderly people. Villeda's team now hopes to find a drug that could mimic this effect and be given to elderly people who are too frail to exercise.

"It's very tantalizing," says Princeton University molecular biologist Coleen Murphy, who studies aging in worms. "We always want people to exercise more and not everybody is going to be able to do that. To be able to give people this in a pill form would be fantastic."

Such a treatment—or even blood from exercising people—could also help younger people who are in rehabilitation and can't work out, suggests Willard Freeman, a University of Oklahoma, Oklahoma City, aging scientist who sees severely injured soldiers as a Veterans Affairs researcher. (Freeman co-authored a commentary on the paper in *Science*.) He cautions, however, that Villeda's team has uncovered just one part of a cascade of events. "We have a lot to learn."

ciencemag.org, 9 July 2020

<https://www.sciencemag.org>

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Research suggests link between PFAS contamination and the coronavirus

2020-07-13

John Wolfe doesn't know what else he can do to protect himself against the coronavirus.

The Wilmington boat captain follows all of the Centers for Disease Control and Prevention guidelines. He wears a mask and requires tourists on his boat to do the same. He practices social distancing and washes his hands frequently.

But Wolfe, like thousands of others who live downstream of the Chemours chemical plant on the Cape Fear River, worries that he may be more susceptible to the coronavirus.

He has reason to be concerned.

Late last month, the CDC's Agency for Toxic Substances and Disease Registry [released a report](#) saying studies suggest that exposure to high levels of fluorinated compounds — commonly referred to as PFAS or "forever chemicals" — could suppress the immune system and increase the risk of getting COVID-19 and the severity of infection.

Studies have also shown that exposure to PFAS could reduce the effectiveness of childhood vaccines and adult flu vaccines.

The agency's report was followed by [an opinion piece](#) from some of the nation's leading PFAS researchers, including Jamie DeWitt of East Carolina University. The article was published July 6 in *Environmental Health News*.

"Most concerning during this global pandemic ... is that exposure to PFAS suppresses the ability of the [immune system](#) to make antibodies — the part of the immune system critically important in fighting COVID-19 and other infectious agents," the article states. "Our studies have found that laboratory animals exposed to PFAS have decreased antibodies, verifying what we have seen in PFAS-exposed people and making us confident that PFAS are toxic to the immune system."

Wolfe's PFAS levels are high

PFAS, a class of per- and polyfluoroalkyl substances, have been in use since the 1940s to make products non-stick, waterproof or stain-resistant. They're used in rain jackets, carpets, upholstery, cookware, fast-food packaging, dental floss and much more.

Studies have also shown that exposure to PFAS could reduce the effectiveness of childhood vaccines and adult flu vaccines.

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DuPont — and Chemours since 2015 — produced PFAS either as a product or a byproduct at a chemical plant near the banks of the Cape Fear River in Bladen County. The Wilmington Star-News disclosed in June 2017 that high levels of GenX and other PFAS had been found in the drinking water for New Hanover, Pender and Brunswick counties.

Wolfe knows that his blood contains high levels of a few of the estimated 5,000 PFAS that exist. He has the results of [blood tests conducted by N.C. State University](#) and released to the public in November 2018 to prove it.

Researchers at N.C. State took tap water samples and drew blood from Wolfe and 344 other people living in the Lower Cape Fear River Basin. They found that the levels of certain types of PFAS were much higher in Wilmington than in the United States as a whole. Wolfe's test results came back higher than the median for all of the study's participants.

Wolfe isn't surprised

On Tuesday, Wolfe said he had just read the opinion piece linking PFAS to the coronavirus.

"My first thought when I read that article was like, 'Of course, of course it does. Why wouldn't it? It already does everything else that's terrible for you. Let's just throw this on the pile,'" he said.

[According to the CDC](#), a large number of studies suggest that PFAS could cause an increased risk of testicular or kidney cancer, increased cholesterol levels, decreased vaccine response in children, changes in liver enzymes, increased risk of high blood pressure or preeclampsia in pregnant women and small decreases in infant birth weights.

Wolfe's blood test found elevated levels of a particularly concerning type of PFAS called Nafion by-product 2, which has been used in the manufacturing process by both Chemours and DuPont. It has been found in tap water downstream of the chemical plant and in private wells surrounding it.

Wolfe said his blood tests revealed that he has a concentration of Nafion by-product 2 of 5.5 parts per trillion, double the median of everyone who participated in the testing.

[A new study](#) published in ScienceDirect found that the livers of mice given high doses of Nafion by-product 2 more than doubled in size compared with a control group.

Filtration systems coming

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It's estimated that 200,000 people get their drinking water from the Cape Fear River below the Chemours Fayetteville Works plant. The Cape Fear Public Utility Authority, which provides water to New Hanover County residents, [is preparing to spend \\$46 million](#) on a granular activated carbon filtration system that is expected to remove most of the PFAS in the finished water it delivers to customers. The system is scheduled to go online in early 2022.

Nearby, Brunswick County plans to [spend \\$137 million](#) on a reverse osmosis filtration system, completion of which appears to have been delayed until May 2023. Both utilities have filed lawsuits against Chemours and DuPont seeking reimbursement for the costs of installing the purification systems.

There are no federal or state standards for PFAS in drinking water. In 2016, the U.S. Environmental Protection Agency [set a health advisory](#) for two of the oldest PFAS — known as PFOA and PFOS — at 70 parts per trillion, either by themselves or in combination. North Carolina set a provisional health advisory of 140 parts per trillion in drinking water for GenX. None of those advisories is legally enforceable, and no other PFAS have health advisories.

Private wells also contain PFAS

People living below the Chemours plant who get their drinking water from the Cape Fear River aren't the only ones in North Carolina dealing with exposure to PFAS in their drinking water.

More than 3,000 homes surrounding the plant have been found to have PFAS in their well water. That contamination, which extends at least 10 miles from the plant, was deposited through the air by DuPont and Chemours and seeped into the groundwater.

Last month, [N.C. State released findings](#) of testing on wells and tap water of 85 homes in the stricken area. Of those, 70 were found to contain GenX — 33 at levels above the state's health guideline. Researchers found that wells containing high levels of GenX also contained high levels of other PFAS.

The researchers drew blood samples from residents, but those results aren't yet available because the university's labs had remained closed during the pandemic.

PFAS hotspots in the state

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There are other hotspots of PFAS contamination in North Carolina. The NC PFAS Testing Network just released a complete data set of testing it conducted at 320 municipal water utilities in the state.

Of those, nearly half had levels of PFAS above the reporting detection level, according to a July 1 article by NC Policy Watch. The network is part of the NC Policy Collaboratory, a consortium of seven universities funded through grants and the General Assembly.

The network found Pittsboro's water supply to have the highest concentration of all types of PFAS measured — a whopping 844.8 parts per trillion. The contamination is believed to be coming largely from industries that discharge into the Haw River upstream of Pittsboro and from an airport in Greensboro.

Researchers at Duke University are conducting studies of blood from Pittsboro residents, and the town has established a task force to help determine the best way to remedy the situation.

Regulating PFAS as a class

The EPA says it continues to address the problems caused by PFAS contamination across the country, including efforts to set maximum contaminant levels for the substances.

But DeWitt, the ECU researcher who has been studying PFAS for 15 years, and other scientists say PFAS need to be federally regulated as a single class. They make that argument in a study published on June 30 in *Environmental Science & Technology Letters*.

"To date, managing the risk of PFAS has focused primarily on one chemical at a time, or a small group of PFAS," the study says. "This approach has not been effective at controlling widespread exposure to this large group of chemicals with known and potential hazards.

"The more we study PFAS, the more we learn about the harm they can do to our health and the environment. However, it is not possible to thoroughly assess every individual PFAS, or combination of PFAS, for their full range of effects in a reasonable time frame. Without effective risk management action around the entire class of PFAS, these chemicals will continue to accumulate and cause harm to human health and ecosystems for generations to come."

New PFAS research center

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Some, including Gov. Roy Cooper, argue that the EPA isn't moving fast enough to limit the danger posed by PFAS.

Wolfe, the Wilmington boat captain, feels the same way. He is angry at DuPont and Chemours and thinks they should be required to clean up the contamination they caused.

"I'm concerned for my health. I'm concerned for my family's health. Why should this be my problem, you know? What failed in the system to allow this to happen the way that it did?" he said.

Wolfe is also frustrated about the coronavirus and the idea that the PFAS could make him more susceptible to the disease.

DeWitt and other scientists can't definitively answer the question of whether people with high exposure to PFAS are more susceptible to COVID-19. No studies on people have been done to confirm what the researchers believe is true.

But DeWitt hinted that that could soon change.

In March, N.C. State announced that it has received a \$7.4 million federal grant to establish the Center for Environmental and Human Health Effects of Per- and Polyfluoroalkyl Substances (PFAS).

The center will bring together researchers from N.C. State and East Carolina University to study PFAS toxicity and bioaccumulation. It is expected to become operational in the fall. When it does, DeWitt said she'll be ready to go to work.

"One of the questions that I will be asking, is just that — why do PFAS suppress the ability of the immune system to make antibodies?" she said.

Mike Watters, administrator for the advocacy group Gray's Creek Residents United Against PFAS in our Wells and Rivers, sent a letter dated June 23 to N.C. State professor Jane Hoppin supporting research into the possible link between PFAS exposure and the coronavirus.

Watters' group has more than 2,400 members, most living just north of the Chemours plant. Hoppin has been the lead researcher in N.C. State's GenX Exposure Study. Watters said he wrote his letter to support Hoppin's quest for additional grant funding.

northcarolinahealthnews.org, 13 July 2020

<https://www.northcarolinahealthnews.org>

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The pandemic virus is slowly mutating. But is it getting more dangerous?

2020-07-14

It's only a tiny change. At some point early in the pandemic, one of the 30,000 letters in the genome of SARS-CoV-2 changed from an A to a G. Today, that mutation, at position 23,403, has spread around the world. It is found in the vast majority of newly sequenced viruses and has become the center of a burning scientific question: Has the mutation become so common because it helps the virus spread faster? Or is it just coincidence?

More than 6 months into the pandemic, the virus' potential to evolve in a nastier direction—or, if we're lucky, become more benign—is unclear. In part that's because it changes more slowly than most other viruses, giving virologists fewer mutations to study. But some virologists also raise an intriguing possibility: that SARS-CoV-2 was already well adapted to humans when it burst onto the world stage at the end of 2019, having quietly honed its ability to infect people beforehand.

On average, the coronavirus accumulates about two changes per month in its genome. Sequencing SARS-CoV-2 genomes helps researchers follow how the virus spreads. Most of the changes don't affect how the virus behaves, but a few may change the disease's transmissibility or severity.

One of the earliest candidates was the wholesale deletion of 382 base pairs in a gene called *ORF8*, whose function is unknown. First reported by Linfa Wang and others at the Duke-NUS Medical School in Singapore in a March preprint, the deletion has since been reported from Taiwan as well. A deletion in the same gene occurred early in the 2003 severe acute respiratory syndrome (SARS) outbreak, caused by a closely related coronavirus; lab experiments later showed that variant replicates less efficiently than its parent, suggesting the mutation may have slowed the SARS epidemic. Cell culture experiments suggest the mutation does not have the same benign effect in SARS-CoV-2, Wang says, "but there are indications that it may cause milder disease in patients."

Weak evidence of a moderate effect

The mutation at position 23,403 has drawn the most attention—in part because it changed the virus' spike, the protein on its surface that attaches to human cells. The mutation changed the amino acid at position 614 of the spike from an aspartic acid (abbreviated D) to a glycine (G), which is why it's called G614.

But some virologists also raise an intriguing possibility: that SARS-CoV-2 was already well adapted to humans when it burst onto the world stage at the end of 2019, having quietly honed its ability to infect people beforehand.

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In a *Cell* paper this month, Bette Korber and colleagues at Los Alamos National Laboratory showed that G614 has become more common in almost every nation and region they looked at, whereas D614 is virtually gone (see graphic, below). That might be a sign that it's outcompeted by G614, but it could also be a coincidence. "Any one mutation may rise to very high frequency across the world, just because of random chance," says Kristian Andersen, a computational biologist at Scripps Research. "This happens all the time."

Comparing the spread of different viral variants carrying the two mutations could reveal a difference. The United Kingdom's COVID-19 Genomics Consortium has sequenced 30,000 SARS-CoV-2 genomes, allowing scientists to compare how fast 43 lineages carrying the G614 mutation and 20 with D614 spread. They estimated that the former grew 1.22 times faster than the latter—but the statistical significance was low. "Evidence for a difference is weak and if it does exist, the estimated effect is moderate," says evolutionary biologist Andrew Rambaut of the University of Edinburgh.

Researchers have also turned to cell culture experiments. When Korber's group engineered so-called viruslike particles to carry one spike protein or the other, the G614 variant appeared to be more efficient at entering cells. Jeremy Luban of the University of Massachusetts Medical School, who has found the same thing, explains that G614 causes a slight change in the shape of the spike, apparently making it easier for the protein to undergo the structural changes that cause the membranes of the virus and the cell to fuse. "Our data looks like it's somewhere between three and 10 times more infectious," Luban says. "That's a pretty enormous effect."

That does not mean the mutation has an effect in the real world, says virologist Emma Hodcroft of the University of Basel. In the past, she notes, "We have cases where we really thought that we had evidence for a mutation that was changing viral behavior and as more evidence came, it didn't seem to be the case." An increased ability to infect a laboratory cell line may not translate to the billions of diverse cells in a human body, adds Angela Rasmussen, a virologist at Columbia University: "Humans aren't Vero cells."

A change for the worse?

Animal experiments are another way to probe the effects of G614. One option, virologist Marion Koopmans of Erasmus Medical Center (EMC) says, would be to infect ferrets with it and D614 and look for differences in how much virus they shed. But infections in ferrets only last about 1 week,

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Koopmans notes. "The effect would have to be very big to show up in an experiment like that."

Another idea is to expose uninfected ferrets to animals carrying either of the two variants and see how well they transmit. An uncontrolled transmission experiment has already taken place on Dutch mink farms, where the new coronavirus jumped from humans to minks at least five separate times. Twice it was the D614 variant, and three times G614, Koopmans says. She hopes data from the outbreaks could show whether either one spread faster and wider than the other. But the experiment doesn't have the rigor of a lab study, she concedes. "We have a natural experiment here. The study design is not optimal."

Whether G614 is more transmissible or not, it has become the dominant strain and the world is living with it, Rambaut says. Most recent estimates of the virus reproduction number—which denotes how well it spreads—are already based mostly on the mutant strain. "What we don't know is whether D614 would have been different," Rambaut says.

Why so little evolution?

The attention lavished on G614 may obscure a bigger question, however: With the virus having spread to at least 11 million people worldwide, why aren't more mutations that affect its behavior emerging?

Perhaps there's just little selection pressure on the virus as it races through millions of immunologically naïve people, scientists say. That could change with the advent of vaccines or new therapies, forcing the virus to evolve. But it could also indicate that the virus has been with people longer than we know, and was spreading before the first known cases in Wuhan, China, in December 2019. "The evolution of this virus to become a human pathogen may have already happened and we missed it," Rasmussen says.

Wang thinks a version of the virus may have circulated earlier in humans in southern Asia, perhaps flying under the radar because it didn't cause severe disease. "If it happens in a small or remote village, even with some people dying, nobody is going to know there's a spillover," Wang says. The virus could then have infected an animal that was brought to Wuhan and started the pandemic.

At Dutch mink farms, after all, the virus jumped not just from humans to animals, but also back from animals to humans, Wang says. "If that can

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happen in the Netherlands, surely it can happen in a village in Thailand, or in Yunnan province in southern China."

sciencemag.org, 14 July 2020

<https://www.sciencemag.org>

A weed killer that's been linked to cancer was found in six types of hummus. Here's what you need to know

2020-07-14

Traces of glyphosate, a weed-killing chemical, has been found in various samples of hummus and chickpeas, according to a new report out today from the Environmental Working Group.

But research is mixed on what amount of the chemical, which has been linked to cancer, is actually harmful to humans.

The non-partisan agency, a human and environmental health non-profit, commissioned an independent laboratory to test samples from 27 non-organic hummus brands, 12 organic hummus brands, and nine organic chickpea brands.

They found that one-third of the non-organic hummus brand samples had more than the EWG-recommended limit for glyphosate, which is 160 parts per billion (ppb) daily for adults. Those samples came from the following brands:

- Sabra Classic Hummus
- Sabra Roasted Pine Nut Hummus
- Whole Foods Market Original Hummus
- Whole Foods Market organic-label Original Hummus
- Cava Traditional Hummus
- Harris Teeter Fresh Foods Market Traditional Artisan Hummus

What is weed killer's link to cancer?

Though EPA said traces of glyphosate aren't worrisome for health, Bayer, the maker of the popular glyphosate-containing weed killer Roundup, paid billions to people who had cancer linked to their product.

As Insider reporter Aria Bendix noted, those cases involved people who inhaled glyphosate, but didn't eat it in their food.

They found that one-third of the non-organic hummus brand samples had more than the EWG-recommended limit for glyphosate, which is 160 parts per billion (ppb) daily for adults.

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But a [May 2017 study](#) called EPA's guidelines for the chemical "outdated," and suggested updating them to decrease the upper limit glyphosate allowed in food.

After reviewing previous research, the study authors concluded that lower levels of glyphosate in food could still be harmful, and existing EPA guidelines "may fail to protect public health and the environment."

In a press release sent to Insider, EWG toxicologist Alexis M. Temkin said hummus consumers should choose organic brands to avoid glyphosate altogether.

Should you avoid hummus?

Environmental health experts have said traces of glyphosate in food shouldn't be cause for concern.

[Alex Lu](#), an associate professor of environmental exposure biology at Harvard who has conducted research on pesticides in children's diets, previously told Insider that the [EWG's glyphosate limit is conservative and the threshold is "too high."](#)

The [daily glyphosate limit stated by the EWG](#) is 5,000 ppb, which is 30 times stricter than the limit recommendation from the Environmental Protection Agency, which allows for up to 30,000 ppb.

This debate reached a crescendo in April 2019, when [hundreds of people filed lawsuits](#) claiming they had contracted cancer linked to the chemical. The EPA reminded consumers its research into glyphosate:

"In 2017, EPA published comprehensive ecological and human health risk assessments for glyphosate. No human health risks were identified," the agency said in a [release](#). The only valid concern, they said, was that "potential [ecological risks](#) were identified for terrestrial and aquatic plants, birds, and mammals, primarily from exposure to spray drift."

[Manolis Kogevinas](#), an environmental researcher at the Barcelona Institute for Global Health, [previously told Business Insider](#): "If you ask me, is the glyphosate the problem in my food? No, it is not."

(But, Kogevinas told reporter Hilary Brueck, he would never use glyphosate to keep his own garden weed-free.)

www.businessinsider.com.au, 14 July 2020

<https://www.businessinsider.com.au>

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Curiosities

JUL. 24, 2020

Mapping vegetation health around the world

2020-07-08

One of the largest sources of uncertainty in projections of Earth's future climate and of the effects of climate change is the cycle of feedbacks between climate and responses of the terrestrial biosphere, particularly Earth's plant life. These feedbacks can both mediate and contribute to rising levels of carbon dioxide (CO₂) in the atmosphere [e.g., [Cox et al., 2013](#)], which can result in different types of responses within ecosystems at different timescales. For example, in boreal (northern) forests in North America and Eurasia, warmer temperatures may facilitate better growing conditions and new environmental niches in some cases [[Bonan et al., 1995](#)]. Warmer temperatures may also increase the frequency and severity of infestations, to which stressed plants are more vulnerable, and fires, both of which affect dominant tree species [[Kurz et al., 2008](#); [Soja et al., 2007](#); [Yurganov et al., 2011](#)]. Tropical and coastal ecosystems, considered highly vulnerable to local- and global-scale stressors, also exhibit complex responses to changing climate conditions. In terrestrial tropical ecosystems, for example, changing conditions have been linked with initial increases in productivity—though these increases may slow over time once CO₂ fertilization saturates [[Li et al., 2018](#)—as well as with detrimental effects on biodiversity. In managed ecosystems throughout the world, changes in water availability are causing increased stresses on food security [[Brown and Funk, 2008](#)], necessitating the collection and use of high-quality data to improve precision management.

Taking Earth's Temperature from Space

In June 2018, NASA launched its Ecosystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) mission, which features an instrument on the International Space Station (ISS). This instrument collects thermal data from Earth's surface with the highest combined spatial, temporal, and spectral resolution to date. These data are used to model evapotranspiration (ET), a measure of water transfer from plants and soils to the atmosphere. Rising temperatures and limited water can result in increased vegetation stress, causing plants to closely conserve water. As the release of water has a cooling effect, stressed plants heat up, a change that can be detected as increases in temperature and ET. Evapotranspiration underpins the ECOSTRESS mission's main science and applications goals to understand (1) how water availability affects key climate biomes around the world, (2) the variability of evapotranspiration on a diurnal (subdaily) scale, and (3) drought onset and agricultural vulnerability.

Tropical and coastal ecosystems, considered highly vulnerable to local- and global-scale stressors, also exhibit complex responses to changing climate conditions.

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To achieve these science and applications objectives, ECOSTRESS produces data at 70-meter resolution. The data product suite includes land surface temperature and emissivity, evapotranspiration, water use efficiency, and evaporative stress (NASA Jet Propulsion Laboratory (JPL) data product levels L2, L3, and L4). ECOSTRESS revisits and collects data over a given area as often as multiple times per day or as infrequently as every few days, depending on location. The ISS travels in a tilted (precessing) orbit, so solar illumination at any given location varies with each successive pass, with conditions repeating every 90 days. Thus, ECOSTRESS is able to sample and acquire data from latitudes between 52°N and 52°S at various times through the diurnal cycle. In February, the ECOSTRESS team convened a 3-day science and applications team meeting with more than 70 attendees in Ventura Beach, Calif. Team members provided updates regarding the mission's status and early results from the science data. Principal investigators from the ECOSTRESS Science and Applications Team also presented about projects selected as part of a NASA Research Opportunities in Space and Earth Science call.

The selected projects span multiple disciplines across studies of terrestrial ecosystems, public health (vector-borne disease and urban heat islands), and geothermal environments, as well as investigations of inland aquatic zones, coastal estuaries, and other coastal systems. One project highlighted the use of ECOSTRESS data to examine urban heat island characteristics at different times of day, with an example in Los Angeles. Another project showed differences in diurnal evapotranspiration patterns depending on land cover type (e.g., agriculture or forests) and detection of thermal pollution from power plants. This meeting also included an update on ECOSTRESS Early Adopters, an initiative from NASA to increase usability and access to mission data. The initiative is using early engagement with the ECOSTRESS team and data sets to cultivate a community of practice.

Yun Yang from the U.S. Department of Agriculture is working with ECOSTRESS data to study agriculture and crop stress. She said, "With the 4-day (or better) revisit time of ECOSTRESS, we'll be able to significantly improve estimates of our seasonal evapotranspiration in the eastern U.S., whereas Landsat alone often gives us, at best, a couple of clear shots of the Earth during the peak crop growth period."

Meeting attendees also participated in a multipart hands-on training on the use of ECOSTRESS data to assess evapotranspiration and land surface temperature in a riverbank (riparian) zone that was affected by the recent drought in California. The training included four components:

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- an introduction to the drought extent and its effects on the Santa Clara River
- a demonstration on how to access ECOSTRESS data and convert them into a user-friendly format
- a tutorial on applying a cloud mask to ECOSTRESS surface temperature products using Jupyter Notebook and QGIS geospatial data software, two open-source tools
- a visit to the study areas

This holistic approach to training using a real-world example helped demonstrate how ECOSTRESS data can be used to assess drought impacts and vegetation stress. In the case of the Santa Clara River example, ECOSTRESS's variable sampling allowed researchers to observe increased water stress in the afternoon relative to morning conditions. The ECOSTRESS team also provided practical tools during the training sessions to help those new to working with ECOSTRESS get started (Figure 1).

New Information Opens New Applications

The recent workshop highlighted the importance of ECOSTRESS data in conducting powerful new science and applications investigations related to terrestrial ecosystems (including effects of wildfire), coastal and inland aquatic ecosystems, geology, and public health. These investigations rely on high spatiotemporal resolution, diurnal sampling, and high-quality data products. Further, the community of researchers working with ECOSTRESS data is collaboratively advancing science and applications, enabled in part by various hands-on tutorials and workflow scripts developed and freely shared by community members.

The community has also reflected on ECOSTRESS within the broader context of the thermal program of record (i.e., the continuity of remote sensing collections of high-resolution thermal data, dating back to 1999, from various Earth science missions) as well as future Earth science missions from the United States and Europe. Early and recently selected ECOSTRESS projects clearly demonstrate how multispectral thermal infrared (TIR) data are needed to address critical decadal survey priorities, in particular those priorities focusing on land surface temperature and evapotranspiration.

A representative from the Surface Biology and Geology (SBG) mission concept team, Charles Miller, discussed the status of the SBG Architecture Study. This study will deliver a suite of observing architecture options to NASA that can be used to address decadal survey priorities using an

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imaging spectrometer (visible to shortwave infrared) and multispectral thermal measurements set. Miller underscored the importance of the latter, stating that “the Surface Biology and Geology mission will benefit tremendously from ECOSTRESS advances in thermal infrared imaging and [our team] will extend high-resolution TIR imaging.” ECOSTRESS, now in its second year aboard the ISS, continues to acquire critical thermal data sets. These data sets are being used to provide insights into the key mission science questions, including revealing critical thresholds in water use efficiency among the climate transition hot spots as well as different vegetation types that exhibit unique patterns in diurnal evapotranspiration.

As the high-resolution data record expands, managing the resulting large-volume data sets presents a key challenge for ECOSTRESS and future Earth-observing missions. Close collaborations between mission teams and data archive centers will result in the codevelopment of new tools and services to support users in accessing and analyzing data more readily. These collaborations and tools will facilitate ECOSTRESS’s contribution to continuity in the thermal program of record as well as to further reducing uncertainty about how Earth’s biosphere and climate interact now and into the future.

eos.org, 8 July 2020

<https://www.eos.org>

Short term prospects for physical security depend upon containing COVID19

2020-07-08

We have charted the fortunes of the world’s physical security business over the last 12 years. Despite cycles of poor world trading conditions and slow economic growth, it has delivered a compound annual growth rate (CAGR) of 6.6 percent; reaching 8% in its peak year of 2019. Then along came COVID-19.

GDP has drastically reduced. In fact, when comparing this past April with the same month in 2019, GDP has been reduced by as much as 20 percent in some countries. How quickly we can get back to normal will depend on how fast we can contain COVID-19. The physical security business will play a significant role in the “new normal” post-COVID, but at the same time, it poses a huge challenge for the industry.

GDP has drastically reduced.

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COVID-19 and the resultant lockdown this year has stopped normal business operations and this has stemmed the flow of business. The immediate future depends upon releasing the lockdown and introducing measures to contain COVID-19. Lockdown is gradually being eased and very substantial financial aid is being given by many governments to assist all businesses to hasten the return to normal.

While the drive to improve the performance of physical security products will not be stunted by COVID-19, it will be more difficult for customers to find the budget to invest and therefore they have to be convinced that they will get a quick return on their investment. In this challenging economy, customers will be demanding more value from their investments and will be less willing to commit to upfront capital expenditures, thus making ACaaS (Access Control-as-a-Service) and VSaaS (Video Surveillance-as-a-Service) even more attractive than it was just six months ago.

This business model is defined as one in which the customer purchases a service or subscription from a third-party service provider that then delivers the service through assets it owns, maintains and improves. “Servitization” replaces the single transaction for delivery of a product with continuous service while improving the customer experience throughout the lifecycle of the asset.

securitytoday.com, 8 July 2020

<https://www.securitytoday.com>

How to stop the coronavirus: What we’ve learned six months in

2020-07-08

SINCE the first reports of the novel coronavirus, the list of known symptoms has changed, as has our understanding of what the virus does to the body. Health advice, for both governments and individuals, has evolved, too. And although some countries claim to have virtually eliminated the virus, others are only now seeing cases beginning to spike and some are seeing what looks like a “second wave” of infections. What can we learn from the countries that got it right – and those that got it so very wrong?

Fast action

What can we learn from the countries that got it right – and those that got it so very wrong?

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One major early fumble was the incorrect assumption that the virus was like the flu. Many nations already had a plan in place for dealing with a pandemic flu. "It inhibited their ability to think about how to respond to another virus," says Jennifer Nuzzo at Johns Hopkins University in Maryland.

The coronavirus required a different response, says Michael Baker at the University of Otago in Wellington, who advised the New Zealand government on the country's covid-19 response. Flu typically has an incubation period – the time between someone becoming infected and showing symptoms – of around one to two days. This makes it extremely difficult to trace the contacts of an infected person before they get sick themselves.

The coronavirus, on the other hand, appears to have an incubation period of about five to six days, but potentially several weeks. "It means that it's a slower moving wave and there are more opportunities to use contact tracing and isolation and quarantine," says Baker. "We know that's the case because [the] SARS [coronavirus] was contained and eliminated with those traditional measures."

"I think we've seen that the results can be devastating when you just let things go"

In addition, while flu can "sweep through a population in a matter of weeks", he says, the coronavirus can stick around for much longer and can have lasting health effects for those who survive covid-19. This is one reason why the idea of waiting to achieve herd immunity rather than taking action to limit the impact of the virus – a strategy the UK and Swedish governments initially considered – was widely dismissed by the scientific community.

Today, the UK has the highest number of recorded coronavirus cases in western Europe, probably in part due to the UK government's delayed response to the outbreak. One factor that unites the nations that have done a better job at limiting case numbers is a quick initial response.

"In countries like China, South Korea, Japan, the initial response was quite rapid, so the containment phase worked really well for them," says Rajiv Chowdhury at the University of Cambridge. By quickly identifying new cases and where they were coming from, these countries stood a much better chance of interrupting the ongoing transmission of the virus, he says.

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Well-timed lockdowns

Another strategy that appears to have been successful was the use of lockdowns: imposing restrictions on movement to contain the spread of disease. A lack of such constraints in Sweden has been widely blamed for the country's level of cases, which far exceeds those of neighbouring countries.

"When you just let things go, and don't implement any control measures... I think we've seen that the results can be devastating," says Susy Hota at the University Health Network in Canada.

Lockdown rules have varied widely worldwide, but implementing restrictions early on worked well for many countries, including China and New Zealand.

New Zealand's lockdown was particularly strict: schools, universities and almost all businesses were shut, and people could only leave their homes for essential reasons. Such measures succeeded in lowering the R number – the average number of people one person with the virus will go on to infect – from around 2 to around 0.5 within five weeks, says Baker.

Modelling has suggested that implementing lockdown just a week earlier in the UK could have avoided 20,000 deaths.

But lockdowns don't necessarily work the same way in low and middle-income countries, where it can be much harder for people living in low-quality housing in densely populated areas to stay home and lose out on income, says Chowdhury. Because such nations may only be able to sustain short-term lockdowns, the timing of these restrictions is crucial, he says.

Chowdhury points out that many countries in South Asia and Central and South America imposed lockdowns when European ones did. At that point, cases were soaring in Europe, while there were few in many low-income nations. In theory, it makes sense to introduce lockdown while cases are still low, says Chowdhury. But because of the difficulties in enforcing restrictions, case numbers continued to rise.

Cases are now climbing in many countries where governments have eased restrictions that have become economically unsustainable. "That's a trend I see in many countries in Latin America, South-East Asia and Africa," says Chowdhury.

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These and other regions are fast becoming the next coronavirus hotspots. Many people in Bangladesh, for example, found it hard to comply with lockdown restrictions, with almost three-quarters of those in urban areas losing their main source of income. In Brazil, mixed messaging from the government weakened the impact of lockdown. The virus is currently spreading significantly in both countries.

Alternative approaches may work better in some countries, says Chowdhury. The World Health Organization (WHO) has recommended that Pakistan, which has also experienced a spike in cases, impose a rolling two-week-on, two-week-off lockdown, for instance. More localised lockdowns could also be effective. This approach has already been adopted in a number of other countries, including in the UK city of Leicester.

Travel restrictions

Lockdown alone isn't enough, however. Since the beginning of the outbreak, the value of testing people for the virus, tracing their contacts and encouraging them to isolate themselves has become clear.

"It has proven to be important, not just for helping to interrupt transmission... but also for us to better understand where transmission is occurring, so we can have targeted efforts to protect people in those environments," says Nuzzo.

Part of New Zealand's success was down to the strengthening of test-and-trace capacities, for example. "New Zealand was not the world leader in this," says Baker. "We learned from the Asian experience." Specifically, Baker and his colleagues followed what had worked in places like Taiwan, which has reported fewer than 10 deaths to date.

Both New Zealand and Taiwan enforced border controls early on in the outbreak, restricting the arrival of travellers who might bring the virus in with them. Travel restrictions also worked well for Nepal and Sri Lanka, says Chowdhury.

Some countries that didn't impose such restrictions appear to have suffered as a result. "That has been a key factor in how quickly we saw the local epidemic become a pandemic in Bangladesh," says Chowdhury. When outbreaks were hitting Europe and the Middle East, Bangladeshis in these regions boarded flights back to the country. "People were scared and wanted to go to their home country, and a good proportion were potentially carrying the virus," says Chowdhury. "It was impossible for the

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local government to screen so many people so suddenly and, as a result, they lost control."

The first UK outbreaks are thought to have been triggered by people returning from ski holidays in Italy and Austria, and cases also came from China, says Patricia Schlagenhaut at the University of Zurich in Switzerland. "It's obvious that travel does contribute a lot to the spread of the virus," she says.

However, at the start of the pandemic, the WHO made a point of not recommending that international travellers be screened for infections or travel be restricted in any way. "Later, they did advise against unnecessary travel," says Schlagenhaut.

But travel restrictions and bans are hard to implement and people can always find ways around them, says Hota. Such restrictions aren't always the best use of resources, either, especially for bigger nations and those that aren't islands, where the challenge is much greater, says Nuzzo. She highlights the experiences of the US, which banned most non-residents from arriving from China in February. "But there are a lot of people travelling from China to the United States anyway because they are residents of the US," says Nuzzo.

The public health resources dedicated to managing this small pool of people could have been better implemented elsewhere, says Nuzzo. "I had a colleague at a large city health department who said that they had two returning travellers from China who they needed to put into quarantine," she recalls. "They had 33 staff dedicated to finding them a hotel, monitoring them, making sure their safety was ensured and making sure they didn't leave," she says.

"It ate up all of [the] resources to do things like expand hospital capacity and protect nursing homes and expand laboratory testing," says Nuzzo. "There was a lot of stuff the US needed to be doing in January, February and early March that [it] just didn't do."

Blocking travel from China didn't help places like New York. The city's huge outbreak is thought to have been triggered by travellers bringing the virus from Europe, says Nuzzo.

Face masks and coverings

A better understanding of how the virus spreads is also changing the way we try to tackle its spread. We have learned, for instance, that people without symptoms can spread the virus. This appears to be true of both

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those who later go on to become unwell and those who never develop any symptoms.

And while we still don't know exactly how important this mode of transmission is for the overall spread of coronavirus, the finding has helped to shift the advice on mask wearing for the public. In April, the WHO advised that people with symptoms should wear a face covering, but that there was no evidence to support mass mask wearing in the wider community.

The organisation changed its position in June, and currently recommends that people over 60 and those with underlying health conditions don a medical-grade mask in settings where they are unable to keep their distance from others. Non-medical masks are also recommended for anyone visiting indoor public settings, such as shops, schools and public transport, as well as those living in cramped conditions, or spending time in areas where there is widespread transmission or where physical distancing is impossible.

Even now, there are no robust, randomised, controlled trials to show that mask wearing in the community slows the virus's transmission. Sceptics caution that cloth masks vary in their ability to limit the spread of infectious particles – and none will completely prevent transmission. There are also concerns that, outside clinical settings, face masks are often improperly used. Many users continue to touch their faces while wearing face coverings, wear them below their noses or fail to wash them between uses, for example, rendering them much less effective.

“Quarantining travellers from China ate up all the US's resources. There was a lot it just couldn't do”

Still, scientific consensus has swung in the past few months. Now, most scientists will argue that, as the use of face masks is supported by a handful of small, weak studies, and they don't do any harm, they are worth using, at least in places where it is hard to keep away from other people. “There's no reason not to use them,” says Nuzzo.

Despite the lessons learned, many countries remain a long way from eliminating the virus, and a mix of strategies will be required. “I think the goal is to keep the case numbers as low as possible until we get a vaccine,” says Nuzzo.

newscientist.com, 8 July 2020

<https://www.newscientist.com>

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Researchers simplify catalytic process for PEF's building blocks production

2020-07-07

Researchers at the Leibniz Institute for Catalysis, LIKAT, in Rostock have developed a catalytic process to produce HMF. HMF is the building blocks of the plastic PEF, a sustainable alternative to PET beverage packaging.

The production of PEF building blocks does not require petroleum, but instead cellulose and essentially only alcohol and air. The process can be transferred into practice immediately. The PEF process manages with a maximum of 60 degrees Celsius, operates at normal atmospheric pressure and can increase its productivity 15 times over under continuous flow conditions.

HMF – The Starting Material for PEF

The starting material for the PEF building blocks is a so-called platform chemical, a furan derivative called HMF, which is produced from cellulose, a polysaccharide from waste products such as agricultural waste.

Dr. Meija, the head of the research project, partnered with Nguyen Trung Thanh, a professor at Hanoi University of Technology. Meija's junior research group offered him the opportunity to develop a simplified process for the production of HMF from rice straw in his habilitation thesis. In parallel, Meija assigned a student from Venezuela, Abel Salazar, the task of improving the PEF process based on HMF.

The Reaction Process – How It Works?

In principle, in this process, a mixture of HMF and alcohol reacts with oxygen and in the presence of a catalyst to form an ester, or more precisely a diester, which can be polymerized to PEF in a further step. Compared to the previous process, the new process at the LIKAT manages with a fractional amount of heat and pressure.

On top of that, the researchers do not supply the required oxygen to the reaction in concentrated form, but rather from the air – which simplified the process considerably and apparently also increased the fun factor of the experiments.

At first, they simply took balloons, blew them up in the laboratory and put

The PEF process manages with a maximum of 60 degrees Celsius, operates at normal atmospheric pressure and can increase its productivity 15 times over under continuous flow conditions.

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them over the apparatus. With three or four reactions at the same time, it made for a nice party scene in the lab. But the use of room air had a disadvantage for the reaction: it ran too slowly.

The product could only be examined the next morning. Meija and his team solved the problem in two places. First, they slightly increased the pressure and found an optimum at 20 bar. Secondly, they replaced the reaction vessel with a microflow reactor.

The starting materials, essentially a mixture of HMF and alcohol, are pressed through a system of fine tubes with oxygen or air. Due to the capillary forced guidance, the oxygen molecules come into contact with the starting mix in a well-dosed manner. The reaction mixture then passes through a cartridge.

There the catalyst is located, which starts the reaction, in this case particles of cobalt oxide and ruthenium, applied to the surface of small beads. This arrangement enables the “oxidative esterification”, as chemists call this reaction, and above all it allows a continuous process.

The catalyst is not consumed, it can be used again and again. The product, the esterified PEF component, leaves the cartridge as a liquid and can now be polymerized. The reaction now runs 15 times faster than when the experiments began. The chemist is convinced that the result will interest many people.

[polymer-additives.specialchem.com](https://www.polymer-additives.specialchem.com), 7 July 2020

<https://www.polymer-additives.specialchem.com>

Horseshoe crab blood is key to making a COVID-19 vaccine—but the ecosystem may suffer

2020-07-02

Each spring, guided by the full moon, hundreds of thousands of horseshoe crabs clamber onto beaches across the U.S. mid-Atlantic to lay their eggs. For hungry birds, it's a cornucopia. For drug companies, it's a crucial resource for making human medicines safe.

That's because these animals' milky-blue blood provides the only known natural source of limulus amebocyte lysate, a substance that detects a contaminant called endotoxin. If even tiny amounts of endotoxin—a type of bacterial toxin—make their way into vaccines, injectable drugs, or other

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sterile pharmaceuticals such as artificial knees and hips, the results can be deadly.

“All pharmaceutical companies around the world rely on these crabs. When you think about it, your mind is boggled by the reliance that we have on this primitive creature,” says Barbara Brummer, state director for The Nature Conservancy in New Jersey.

Every year, pharmaceutical companies round up half a million Atlantic horseshoe crabs, bleed them, and return them to the ocean— after which many will die. This practice, combined with overharvesting of the crabs for fishing bait, has caused a decline in the species in the region in the past few decades.

In 1990, biologists estimated 1.24 million crabs spawned in Delaware Bay, a main egg-laying spot and prime collection point for the companies. By 2002, that number had dropped to 333,500. In recent years, numbers of Delaware Bay spawning crabs have hovered around the same amount, with the 2019 survey estimating about 335,211. (The pandemic canceled the 2020 crab count.)

Catching crabs and harvesting their blood is time-consuming, and the resulting lysate costs \$60,000 per gallon. In 2016, a synthetic alternative to crab lysate, recombinant factor C (rFC), was approved as an alternative in Europe, and a handful of U.S. drug companies also began using it.

But on June 1, 2020, the American Pharmacopeia, which sets the scientific standards for drugs and other products in the U.S., declined to place rFC on equal footing with crab lysate, claiming that its safety is still unproven.

Starting in July, Swiss-based Lonza will begin manufacturing a COVID-19 vaccine for human clinical trials—and they'll have to use lysate in the vaccine if they plan to sell it in the U.S. (Here's how we'll know when a COVID-19 vaccine is ready.)

Human health and safety, especially for something as high stakes as the coronavirus vaccine, is paramount, says Brummer. But she and other conservationists fear that without rFC or other alternatives available, the ongoing burden on horseshoe crab blood for COVID-19 vaccines and related therapeutics may imperil the crabs and the marine ecosystems that depend on them.

**For hungry birds,
it's a cornucopia. For
drug companies, it's
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medicines safe.**

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A written statement from Lonza says that testing the company's COVID-19 vaccine will not require more than a day's worth of lysate production from the three U.S. manufacturers.

One of those three—[Charles River Laboratories](#), based in Massachusetts—gave National Geographic the same statistic. The laboratory's John Dubczak explained in an email that to make five billion doses of the COVID-19 vaccine, 600,000 tests will be performed, which will use the amount of lysate created in a single day.

"This places no undue burden on the [lysate] supply chain or horseshoe crab populations," said Dubczak, executive director of reagent development and pilot program operations.

Blue bloods

Nearly unchanged for hundreds of millions of years, horseshoe crabs have some unusual traits. Despite their name, [these creatures are more closely related to spiders and scorpions](#) than crabs. They also have nine eyes—two compound eyes and seven simple ones. ([Read more about how horseshoe crabs evolved.](#))

In 1956, [medical researcher Fred Bang noticed another strange characteristic](#): When horseshoe crab blood interacts with endotoxin, cells called amebocytes clot and form a solid mass. Bang realized that these amebocytes—part of the crab's ancient immune system—could detect deadly bacterial contaminants in the rapidly expanding array of pharmaceuticals designed to enter the human bloodstream.

Scientists eventually figured out how to use the amebocyte lysate to test drugs and vaccines, and in 1977, [the U.S. Food and Drug Administration approved horseshoe crab lysate](#) for this use.

Since then, each May the helmet-shaped creatures are brought en masse to specialized labs along the U.S. East Coast, where technicians extract the blood from a vein near the heart before returning them to the sea. (Their blue blood comes from the metal copper in their oxygen-transporting proteins, called hemocyanin.)

In the 1980s and through the early 1990s, the process seemed sustainable. The pharmaceutical industry claimed that only three percent of the crabs they bled died. Population surveys showed that the crabs were plentiful, and conservationists didn't place much value on the species, says [Larry Niles](#), a biologist with the Conserve Wildlife Foundation of New Jersey.

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But by the early 2000s, the picture began to shift. [Annual horseshoe crab counts](#) during spawning season revealed smaller numbers, and a 2010 study found that [as many as 30 percent of the bled crabs ultimately died](#)—10 times as many as first estimated.

"What we're fighting isn't just a battle about horseshoe crabs. It's about keeping ecosystems productive," says Niles, who has spent his career researching the environment and species of Delaware Bay.

Lonza, the Swiss corporation, says it is "committed to protecting the welfare of the horseshoe crab," for instance by "actively supporting conservation efforts."

According to the statement from Lonza, Charles River Laboratories and another lysate maker, Associates of Cape Cod, Inc., raise horseshoe crabs in hatcheries and release them into the ocean. Lonza reports that in 2019, the Cape Cod company reintroduced 100,000 juvenile crabs into the waters around Massachusetts and Rhode Island.

Lonza's statement says the company would also prefer to use lysate alternatives and has trademarked its own rFC, called [PyroGene](#). But, as the American Pharmacopeia decision illustrates, "regulatory hurdles remain. We remain hopeful that the barriers preventing drug developers from using the synthetic alternatives are starting to fall," the statement says.

Disrupting the food chain

Meanwhile, conservationists are monitoring the impact to the species that rely on horseshoe crab eggs as vital food sources.

Sport fish that once were numerous, such as striped bass and flounder, have plummeted in number in the region, in part due to fewer horseshoe crab eggs, Niles says. [Diamondback terrapins](#), a type of reptile [that's vulnerable to extinction](#), also depend on this seasonal buffet.

Both Niles and Brummer are particularly concerned about [migratory shorebirds](#), such as red knots and ruddy turnstones, which stop at Delaware Bay on their 9,000-mile journey from Tierra del Fuego in Chile to Arctic breeding grounds. These birds need tremendous amounts of energy for their long-distance flights, and calorie-rich horseshoe crab eggs are the perfect fuel. ([Read how climate change is shrinking red knots.](#))

During their two-week sojourn on Delaware Bay, red knots nearly double their body weight to prepare for the final leg of their voyage. This year,

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however, cool temperatures delayed crab spawning, and only 30,000 red knots stayed in the bay, a drop from an estimated 40,000 birds in 2019.

Niles cautions that a weakening of one link in the food chain can reverberate, with potentially disastrous consequences. The depletion of horseshoe crabs could ultimately eliminate benefits that tourists, fishermen, and others get from enjoying the bay.

“The value of a natural resource,” he says, “doesn’t belong to companies that are exploiting it. It belongs to us.”

[nationalgeographic.com](https://www.nationalgeographic.com), 2 July 2020

<https://www.nationalgeographic.com>

How a blue protein turns tree frogs bright green

2020-07-13

What color makes tree frogs so vibrantly green? The blue beneath their skin, of course. Those are the findings of a new study, which reveal that a unique protein complex that reflects blue light is responsible for an unusual green—helping them blend in to their surroundings and evade predators.

Scientists came across the complex while trying to understand how hundreds of tree frog species can accumulate large amounts of a toxic green pigment known as biliverdin. In most animals, biliverdin is so dangerous that it is immediately broken down or excreted. In humans, it forms when red blood cells break down and causes the greenish color sometimes seen in bruises. But in these frogs, it builds up to what should be intolerable levels.

When the researchers isolated the pigment in eight species, they found it stayed stable—and innocuous—**by binding with another protein called a serpine**, the team reports today in the *Proceedings of the National Academy of Sciences*. The biliverdin-serpine complex was found throughout the body, in the lymph, muscles, and skin. And because frog skin is mostly yellow, it looks bright green wherever the protein is present.

In the back of an *Aplastodiscus leucopygius* tree frog (above), the green even has a dash of red, helping it blend in with surrounding vegetation. But in body parts without yellow pigment—like the tree frog’s belly—the blue shows through. This combination shifts daily. In the day, the scientists

In most animals, biliverdin is so dangerous that it is immediately broken down or excreted.

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found, it spreads out to help sleeping frogs blend in; by night, the protein complex moves into the legs and the gut.

[sciencemag.org](https://www.sciencemag.org), 13 July 2020

<https://www.sciencemag.org>

Seawater could provide nearly unlimited amounts of critical battery material

2020-07-13

Booming electric vehicle sales have spurred a growing demand for lithium. But the light metal, which is essential for making power-packed rechargeable batteries, isn’t abundant. Now, researchers report a major step toward tapping a virtually limitless lithium supply: pulling it straight out of seawater.

“This represents substantial progress” for the field, says Jang Wook Choi, a chemical engineer at Seoul National University who was not involved with the work. He adds that the approach might also prove useful for reclaiming lithium from used batteries.

Lithium is prized for rechargeables because it stores more energy by weight than other battery materials. Manufacturers use more than 160,000 tons of the material every year, a number expected to grow nearly 10-fold over the next decade. But lithium supplies are limited and concentrated in a handful of countries, where the metal is either mined or extracted from briny water.

Lithium’s scarcity has raised concerns that future shortages could cause battery prices to skyrocket and stymie the growth of electric vehicles and other lithium-dependent technologies such as Tesla Powerwalls, stationary batteries often used to store rooftop solar power.

Seawater could come to the rescue. The world’s oceans contain an estimated 180 billion tons of lithium. But it’s dilute, present at roughly 0.2 parts per million. Researchers have devised numerous filters and membranes to try to selectively extract lithium from seawater. But those efforts rely on evaporating away much of the water to concentrate the lithium, which requires extensive land use and time. To date such efforts have not proved economical.

Choi and other researchers have also tried to use lithium-ion battery electrodes to pull lithium directly from seawater and brines without the need for first evaporating the water. Those electrodes consist of

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sandwichlike layered materials designed to trap and hold lithium ions as a battery charges. In seawater, a negative electrical voltage applied to a lithium-grabbing electrode pulls lithium ions into the electrode. But it also pulls in sodium, a chemically similar element that is about 100,000 times more abundant in seawater than lithium. If the two elements push their way into the electrode at the same rate, sodium almost completely crowds out the lithium.

To get around this problem, researchers led by Yi Cui, a materials scientist at Stanford University, looked for ways to make electrode materials more selective. First, they coated an electrode with a thin layer of titanium dioxide as a barrier. Because lithium ions are smaller than sodium, it is easier for them to wriggle through and into the electrode sandwich.

The researchers also changed the way they controlled the electric voltage. Instead of applying a constant negative voltage to the electrode, as others had done, they cycled it. First, they applied a negative voltage, and then they briefly turned it off. Next, they applied a positive voltage, turned it off again, and repeated the cycle.

The change in voltage, Cui explains, causes lithium and sodium ions to move into the electrode, stop, and then start to move back out when the current reverses. However, because the electrode material has a slightly higher affinity for lithium than sodium, lithium ions are the first to move into the electrodes and the last to leave. So, repeating this cycle concentrates lithium in the electrode. After 10 such cycles, taking just minutes, **Cui and colleagues ended up with a one-to-one ratio of lithium to sodium**, they report this month in *Joule*.

“That doubles the selectivity, at least,” compared with previous attempts to use battery electrodes to harvest lithium, says Chong Liu, a materials scientist at the University of Chicago who previously was a postdoctoral scientist in Cui’s laboratory.

The advance is still not likely cheap enough to compete with mining lithium on land, Liu says. However, she says her group is attempting to increase selectivity using other types of lithium-ion battery electrodes.

Choi adds that the approach might also prove useful for recovering lithium from discarded batteries, giving the metal a second lease on life—and potentially supercharging the ascendancy of electric vehicles.

sciencemag.org, 13 July 2020

<https://www.sciencemag.org>

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Your car is spewing microplastics that blow around the world

2020-07-14

WHEN THE WORLD fully transitions from cars that run on dinosaur juice to cars that run on electricity, humanity will have eliminated a major source of planet-warming carbon dioxide and a major threat to human health—air pollution kills nearly 550,000 children under age 5 each year. But a hidden environmental threat from cars will persist, and perhaps get worse as more of the world enters the middle class, putting more vehicles on the road: the microplastics that shear off cars’ tires and brakes. Tires are made of rubber but also contain synthetic elastomers and fibers to improve stability; brakes are a mixture of metal and plastic. Little fragments of these materials erode with friction whenever rubber meets the road or you hit the brakes, and these pieces end up in the gutter. Later, they wash out to sea in rainwater, or get caught up in the wind.

Today in the journal *Nature Communications*, researchers model how microplastics from our cars are traveling from densely populated regions into the environment. These little automotive bits pour from the cities of Europe, Asia, and the Americas, and settle out in the Arctic, Greenland, and the world’s oceans. The researchers find that the mean lifetime for the smallest particles, which more easily get caught up in winds, is nearly a month. Their modeling calculates that 52,000 tons of the smallest particles end up in the sea each year, and 20,000 tons end up in remote snowy and icy regions.

By combining data on tire and brake wear with existing methods of calculating the transportation of pollutants in the atmosphere, the scientists build on a growing body of evidence that the wind is dispersing an astonishing amount of microplastics, both near and far. “Small particles are lofting higher, of course. But they also weigh less than larger ones and can easily reach remote regions under favorable meteorological conditions,” says Nikolaos Evangelidou, senior researcher at the Norwegian Institute for Air Research and lead author of the new paper. “Larger particles are usually deposited near the sources.”

This jibes with fieldwork that over the last few years has found microplastics far away from human activity, such as on the tops of the French Pyrenees, in formerly-pristine regions like the Arctic, and falling from the sky onto protected areas in the western US national parks. “Generally speaking, it is an important study because it highlights just how important the atmosphere is in terms of microplastic transport, especially

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to the ocean and remote areas such as the Arctic," says marine ecologist Melanie Bergmann of the Alfred Wegener Institute for Polar and Marine Research, who studies microplastics but wasn't involved in this new work.

Bergmann's own field research last year found that microplastics are indeed blowing from Europe into the Arctic. A whole lot of them, too: In a single liter of snow, she found 14,000 plastic particles. This new research, she says, "helps to explain why we found such high amounts of microplastic in Arctic snow, but also in our Arctic Ocean samples, all the way down to the deep Arctic seafloor—13,000 microplastic particles per kilogram of sediment."

But because this new research is based on atmospheric models rather than fieldwork, she continues, "we need more empirical data and experiments to validate the results and understand the underlying processes, especially to find out if colored microplastic in ice and snow does decrease the reflectance of sun light and thereby enhances global heating."

This reflectance is known as albedo, and it's a serious concern in the Arctic. Because ice is white, it reflects a good deal of the sun's energy back into space compared to the land, which is darker and absorbs more energy. One of the reasons the Arctic is warming twice as fast as the rest of the planet is that as ice disappears in a warming world, it exposes darker waters or land, further heating a region in a nasty feedback loop. Now that scientists know the Arctic is laced with microplastics blown in from Europe, and now that this new work has modeled that route of transport in fine detail, they are concerned that synthetic particles might be darkening snow and ice, accelerating melting.

"We believe it might be the case," says Evangeliou. "We are currently making simulations to calculate the climatic parameter of the microplastic dispersion, but it is rather speculated in the paper as a possible impact on the climate."

The easy transportation of these particles comes down to the dual charms—and evils—of plastics: These materials are both extremely lightweight and extremely tough. Car tires and brakes are meant to last, and their chemical composition means that after the particles slough off, they just break into smaller pieces as they tumble through the environment. That plastic never actually goes away—it just disintegrates.

Given what scientists already know about the transportation of objects in the atmosphere, perhaps it's not surprising that microplastics from cars are so readily blowing around the world. In June, the Sahara desert did its

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annual burping of dust, much of it quite coarse, which blew clear across the Atlantic and settled in the southern US. "That dust is largely mineral material, which is way more dense than plastics are," says Janice Brahney, an environmental scientist at Utah State University. (Her own research has found that microplastics are falling out of the sky, but she wasn't involved in this new research.) Spiders ride the wind, too: Some species let out a bit of silk that lofts them high into the air, known as ballooning, flying hundreds of miles.

But the flight of microplastic particles gets tricky, because they come in such a wide array of shapes. Wispy microfibers might take to the air much like spider silk, but tiny chunks of tires and brakes presumably behave differently in the atmosphere. "It is very difficult to understand the physics of what might keep a particle afloat that isn't a perfect sphere," says Brahney.

Different kinds of plastics might behave differently as well, given their varying densities. This almost certainly complicates the patterns that the authors of the new paper noticed: Smaller particles travel farther. Say two microfibers are the same shape, but different weights. Or say that a microfiber and a fragment of microplastic are different shapes, but the same weight. How does this affect how they travel through the atmosphere?

And even if they stay at ground level, microplastic particles from tires and brakes end up escaping the freeways, in this case by flowing out to sea. Last year, scientists calculated that the densely-populated cities surrounding the San Francisco Bay are washing 7 trillion—yes, with a "t"—microplastic particles into that body of water each year. Tiny bits of plastic slough off tires and brakes and accumulate on roads before rainwater washes all the gunk into the sea.

The big question that scientists are just beginning to answer: What implications might this insidious new kind of pollution have for ecosystems and human health? Microplastic particles are certainly small enough to penetrate deep into our lungs, and could be leaching their component chemicals while in there. In the sea at least, microplastics have also been shown to accumulate bacteria and viruses—whether they're doing the same while floating in the air is to be determined.

"It seems to be one of the first questions people ask me," says Brahney. "And I'm not a doctor, so I have a hard time answering it. But like: *How* are we ingesting it?" Might the littlest bits of microplastic actually pass through the gut lining and work their way into other organs? How long do

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the particles persist in the lungs? These are all questions that scientists are starting to chip away at.

And while we may not have those answers right away, in the meantime, we will probably have more cars. One recent Goldman Sachs report estimated that by the year 2025, new car sales in emerging markets would be more than double those in other nations, a consequence of per capita income gains. The pandemic may only accelerate the trend as people avoid public transportation for fear of contracting Covid-19, or as transit agencies trim schedules or try carshare-style alternatives. More wheels and more brakes mean more microplastics. Bumpy roads are ahead, that's for sure.

wired.com, 14 July 2020

<a href="https://www.wired.com/story/your-car-is-spewing-microplastics/"

Less than a third of Antarctica remains untouched by humans

2020-07-15

Less than a third of Antarctica is still entirely pristine and free from direct human influence, according to an analysis that scientists say shows the need for greater environmental protections in the remote region.

Scientific research on the continent ramped up in the 1950s, but in recent years human activity has accelerated further, with more researchers visiting to better understand the region's impact on global sea level rise. Cruises to Antarctica are growing too: before the coronavirus pandemic, around 50,000 tourists had been expected to visit this year.

To see if the existing legal protections for Antarctica are sufficient in the face of such pressure, Steven Chown at Monash University in Melbourne, Australia, and his colleagues analysed 2.7 million records covering the past two centuries of human activity on the continent, including newly digitised books by explorers. Based on four accepted definitions of wilderness used globally, they found that between 99.57 and 100 per cent of Antarctica could be considered wilderness.

However, when the team narrowed the definition to areas that have never been visited by humans, that figure dropped to around 32 per cent. Such untouched areas are considered important for the region's biodiversity as a baseline to measure growing human impact, and because 12 countries

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have explicitly promised to protect them under the Antarctic Treaty, an agreement that promotes scientific cooperation in the region, among other aims.

"If you trample through a moss bed, the mosses can take years to recover. If we really want to keep Antarctica pristine, which is what all the nations signed up to the treaty have said, are there any left for them to keep? It turns out not much," says Chown.

The results likely underestimate how much of the region has been touched by humans. Records of human activity miss some current research expeditions and data on Soviet-era activity can be patchy. The British Antarctic Survey (BAS) once stumbled across an unrecorded Russian building dating back to the 1970s on the south-east Antarctic Peninsula, for example.

Peter Convey at the BAS, who wasn't involved in the study, says the research makes "a major contribution to our knowledge of human footprint within Antarctica, and provides data of potential use in the planning of further protected areas".

newscientist.com, 15 July 2020

https://www.newscientist.com

Is there another planet in the universe just like Earth?

2020-07-08

THE hunt to find exoplanets like our own has only just begun. In 1992, the first planets outside our solar system were discovered via a pulsar 2300 light years away that signalled at slightly odd intervals, indicating there were two worlds orbiting it. Now, we know there are potentially millions of them out there and more are found every day, says Danielle George, the host of *Exoplanets*, a six-part series on Audible.

George is an experienced guide to the galaxy: she has worked with Stephen Hawking on the search for far-off worlds, as well as NASA and the European Space Agency. With other researchers as guests, she tackles questions about the size of the universe and what kind of life may live within it.

Though it lacks drama at times, the series is an interesting look at the current state of exoplanet science. George, an optimist, believes there is another Earth-like planet out there somewhere. Any plans for humans to

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visit such a place should be shelved, however, as exoplanets are all very far away.

The thornier question, then, is: are we alone or could there be intelligent life on an exoplanet somewhere? The series comes to an answer – sort of. If there were other advanced societies out there, surely they would have attempted to detect us in search of another home? Perhaps they don't need to, having taken better care of their home planet: a message that George says we need to take to heart.

newscientist.com, 8 July 2020

<https://www.newscientist.com>

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